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ABSTRACT

This collection of teacher-developed material is designed to integrate environmental education into various disciplines taught in public schools. Units contain an overview, list of needed materials and equipment, background information, description of the activity, and discussion of related activity or a list of questions pertinent to the unit. (RE)

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ENVIRONMENTAL EDUCATION CURRICULUM MATERIALS

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ENVIRONMENTAL EDUCATION
CURRICULUM MATERIALS (7-12)

Bear Creek Watershed Environmental
Education Project

P. O. Box 880
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Allan M. O'Neal, Jr., Editor-Director

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FOREWORD

The Bear Creek Watershed Environmental Education Project, referred to as BCWEEP, is a cooperative project entered into by the school systems listed below.

Muscle Shoals City	Haleyville City
Russellville City	Franklin County
Tuscumbia City	Marion County
Sheffield City	Colbert County
Winfield City	Winston County
Florence City	Lauderdale County

These school systems recognize the need for giving their young people opportunities to learn about their relationships to the environment in which we live. They also realize that in order to make such learning truly relevant, classroom learning needs to be complemented by learning through direct experiences in the natural world. Thus, in March of 1974, the BCWEEP applied for funds through the U.S. Office of Education for an Environmental Education General Grant under Public Law 91-516. These funds would be used to develop environmental education curriculum material for grades 7-12. The proposal was approved in June

of 1974, and Allan O'Neal, Director of the BCWEEP was appointed to direct the project. Teachers from each school system assisted in the writing, evaluating and editing of the curriculum materials.

These environmental education curriculum materials should be of invaluable help to teachers who recognize the urgent need for young people to understand and respect our environment. These teachers should also recognize the potential of the outdoors as a learning environment and as an integral part of the entire educational process.

DIRECTION AND MEASUREMENT SKILLS

Overview: A compass can be used for direction and measurement skills.

Materials and Equipment: Silva compass, eleven wooden stakes, numbered from one to eleven.

Background: Students should know the length of their steps and how to use a compass.

Activities: Arrange the stakes in a straight line ten feet apart, running north and south. Divide the students into pairs giving each pair a set of directions and distances to follow. The beginning number in each direction, example (1), is the stake where they are to begin. The last number is the stake where they should end, example (2).

For interesting results, don't give the students the number of the stake where they should end. Have them do the exercise until they end up on the correct stake.

(1) 40'x58° - 70'x258° - 50'x95° - 15'x300° (2)
(2) 30'x232° - 70'x352° - 65'x75° - 40'x215° (6)
(3) 60'x27° - 50'x290° - 20'x245° - 40'x108° (8)
(4) 40'x238° - 70'x35° - 30'x122° - 55'x210° (1)
(5) 45'x50° - 70'x196° - 90'x324° - 40'x108° (7)

Related Activity: Do the same activities using the metric system. Take the students on a cross-country hike using maps.

MULTIPLYING BY FEET AND INCHES

Overview: To demonstrate one use of measuring and multiplying by feet and inches.

Materials and Equipment: Paper and pencil

Background: Students should know the length of their step.

Activities: Take the students to a level area on the campus near a tree.

Place on the ground an object used as a marker that is approximately the distance from the trunk of the tree that the tree measures in height. The tree represents one side of the stream bank and the marker the other side of the stream. Seat the students on stream bank under the tree.

Start the activity by telling the students about Daniel Boone running through the forest to get away from the Indians. He comes upon a stream that is too wide for him to jump and its water is moving too fast for him to attempt to swim. What must Daniel do to get away from the Indians?

As you tell the story, add lines of your own to make it more interesting.

Involve the students in a discussion on how they think Daniel could get away from the Indians.

Measure the width of the stream by standing next to the tree, facing the other bank. Place your hand (index finger)

on your eyebrows in a saluting position. Leaving your index finger on your eyebrow with your fingers together, lower your hand until all you can see looking under your little finger is the other side of the stream bank. Now make a 90° turn without bobbing your head or moving your hand. Looking under your little finger, pick out the farthest object that you can see (leaf, rock, etc.).

Walk to that object counting your steps. By multiplying the length of your step by the number of steps that it takes, you can figure out the width of the stream.

Related Activity: Measure the height of the tree.

ADDING OR MULTIPLYING FEET AND INCHES

Overview: Students will learn how to add or multiply feet and inches. They will also be involved in changing inches to feet. The activity will be measuring the height of a tree.

Materials and Equipment: Paper and pencil

Activities: Have one student of known height stand next to a tree. Then have the rest of the class stand 40 feet or more away from the tree facing the tree. With pencil in hand perpendicular to the ground, at arm's length, sight across the top of the pencil to the top of the student's head who is standing next to the tree. Slide your thumb up or down the pencil until you are able to sight across your thumb to his feet. The distance from the top of the pencil to your thumb, in your eye, will be equal to the height of the student standing next to the tree.

Move your hand up sighting across your thumb to the top of the student's head, then sight across the top of the pencil at some new spot on the tree. This spot will be twice the height of the student standing next to the tree. If you continue in the same manner moving up the tree you can measure the height of the tree.

Example: Allan is 5'8" tall, the tree measures 4 pencil lengths tall,

5'8"

x 4

20'32" or 22'8" equals height of the tree

PERIMETER AND AREA

Overview: The students should learn that perimeter is the distance around an area. They also learn that area is measured by square inches, square feet, square yards, and square miles.

Materials: Yard stick, tapes, pencils, and worksheet

Questions:

1) What is the formula for finding the perimeter of an object?
2) How would we find the perimeter of this room?
3) What is the formula for finding the area of a rectangle?
4) How would we find the area of this room?

Then take the class outside, divide them into three groups to do the following activities:

1) Group one go outside and find the perimeter of the walk from the school building to the gym.
2) Group two go outside and find the area of the walk from the front wing to the back wing of the building.
3) Group three go outside and find the perimeter of the walk from the front wing to the back wing of the building.
4) When you have completed your activity, group one rotate to activity for group two. Group two rotate to activity for group three. Group three rotate to activity for group one.

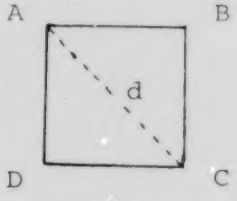
AREA OF A SQUARE
Using $A = \frac{1}{2}d^2$

Overview: Students will make a large square on the campus and prove that the area of a square equals one-half the square of the length of one of its diagonals. Area of a square = $\frac{1}{2}d^2$. The answer will be compared with the formula for the area of a square ($A=S^2$).

Materials and Equipment: String, tape measure, square piece of cardboard, four wooden stakes, paper and pencil

Activities: Drive a stake into the ground to represent point (A). At a distance of 40 feet from (A) drive a stake to represent point (B). Using the cardboard square to form a right angle place stake (C) 30 feet from point (B) and perpendicular to line (AB). Using the cardboard square to form a right angle place stake (D) 30 feet from (C) which will be perpendicualr to line (BC) and parallel to line (AB). Stretch a string from stake (A) to (B) to (C) to (D) to (A). A square will be formed.

Measure diagonally from stake (A) to stake (C). Apply the formula: $A=\frac{1}{2}d^2$. Compare your answer with the formula $A = S^2$.



AREA OF A SQUARE
Using Triangles

Overview: Students will make a large square on the campus and use the formula for finding the area of a triangle ($\frac{1}{2}bxh$).

Materials and Equipment: String, tape measure, square peice of cardboard, four wooden stakes, paper and pencil

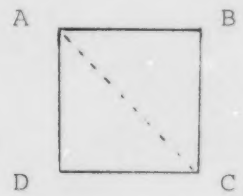
Activities: Have the students make a square with 40 foot sides using the directions found in the lesson - Area of a square using $A = \frac{1}{2}d^2$.

Once the square is made, stretch a string from stake A to C. This will divide the square into two triangles.

Use the formula $A = \frac{1}{2}b \times h$ to find the areas of both triangles. Add the areas of both triangles together to obtain the area of the square.

Compare the answers of the following formulas:

Area of the square ABCD is equal to S^2 or 160 square feet.
Areas of triangles ABC and ACD are equal to the area of square ABCD or 160 square feet.



SQUARE FEET AND CUBIC FEET

Overview: Students will learn how to figure the number of square feet in a flat surface or the number of cubic feet in a cubical.

Materials and Equipment: Ruler, yardstick, tape measure or meter stick. Students may prefer to use their step to measure if they know the length of their step.

Activities: Take students outside and measure the length and width of a sidewalk. Multiply the length times the width to obtain the number of square feet.

To obtain the number of cubic feet in a sidewalk, multiply the width times the length times the depth.

SQUARE FEET

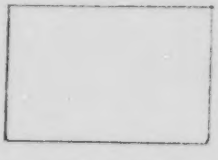
Overview: This lesson is designed to test the student's knowledge of finding the number of square feet in a figure.

Materials and Equipment: Paper, pencil, measuring tape and a one hundred foot string

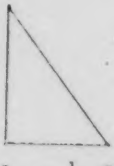
Activities: Divide the class into several groups and give each group a one hundred foot string.

Their problem is to construct a figure that will contain the most square feet. Then, they should prove on paper using at least 3 examples why their figure contains the most square feet.

$A = S^2$
$A = 25^2$
$A = 625$ sq. ft.



$A = L \times W$
$A = 40 \times 10$
$A = 400$ sq. ft.



$A = \frac{1}{2}$ BH
$A = \frac{1}{2}(19)\ (38)$
$A = 200$ sq. ft.

$D = \frac{C}{\pi}$

$D = \frac{100}{3.14}$

$D = 31.8$
$D = 32$ ft.

$A = \pi r^2$
$A = 3.14 \times 16^2$
$A = 3.14 \times 256$
$A = 803.84$
sq. ft.

MEASUREMENT

Overview: Students will become acquainted with the following measurements: inches, feet and yards.

Materials and Equipment: Paper, pencil, rulers and yardsticks

Activities: Take the students outside to the block incenerator that measures 5 feet in height. Using the rulers and yardsticks, have the students answer the following statements true or false. If false give the right answer.

1) The wall is less than 2 yards high.
2) The wall is less than 1 yard high.
3) The wall is 60 inches high.
4) The wall is more than 1 yard high.
5) The wall is 1 yard and 2 feet high.
6) The wall is 1 yard and 3 feet high.
7) The wall is 10 inches less than 2 yards high.
8) The wall is 12 inches less than 6 feet high.

MEASURING HORIZONTAL DISTANCES

Overview: This exercise will teach students how to determine the length of their step. By knowing the length of their step they will be able to measure horizontal distances as well as apply it to the formulas for the measurement of vertical distances.

This exercise may be used to teach division using decimals, division with a fraction for a remainder, changing decimals and fractions to inches, multiplication using decimals and fractions, and the metric system.

Materials and Equipment: One hundred foot tape measure, paper and pencil

Activities:

1) Take the students outdoors to a level area.
2) Mark off a distance of one hundred feet.
3) Have the students walk at their normal step the one hundred feet counting their steps.
4) Divide the number of steps taken into one hundred. The answer will be the length of the student's step.

Each student knowing his step can now measure the length of the football field, sidewalk, building, etc.

MOVING WATER

Overview: Students will learn how to measure the rate of flow and the volume of water in a stream

Materials and Equipment: Paper, pencil, yardstick, tape measure, a short wooden pencil and a watch with a second hand.

Activities: Take the students to a stream. (For safety reasons, use a stream that can be waded.)

Using the tape measure, measure the width of the stream. Your answer should be in feet.

Using the yardstick, take several depth readings and, then, calculate the average depth. Divide by 12 so your answer will be in feet.

The students may want to sketch the bottom of the stream on paper using the depth readings.

To figure how fast the water is flowing, measure a distance of ten feet along the stream. Throw the "short pencil" into the water above the upstream mark and count the number of seconds it takes the pencil to travel the 10 feet.

Divide the 10 feet traveled by the number of seconds to find the rate of flow per second.

To figure the volume of water flowing in this stream, multiply the average depth (in feet) by the average width (in feet) by the rate of flow per second (in feet). Your answer will be in the number of cubic feet per second that the stream is flowing. One cubic foot = 7.4805 gallons.

PERCENT

Overview: Students will determine what percent of their school ground is paved and what percent of their school ground has buildings on it.

Materials and Equipment: Paper, pencil and measuring tape

Activities: Take the class outside and have them determine the area of the school grounds, the paved area and the area of the school buildings.

Then, have the students determine what percentage of the school property is buildings and what percentage is paved and what percentage is a lawn.

PERCENTAGE

Overview: Students will count cars and determine what percentage of the cars counted are red, blue, etc.

Material and Equipment: Paper and pencil

Activities: Have all students write on their paper the color of a car that they think is the most common. Then take the class outside to make a survey of the color of cars that pass the school in a ten minute interval.

This may be done one day at the beginning of the class period, one day in the middle of the class period and once at the end of the class period to obtain a true count.

When the class has made a count of the cars and listed them as to color, have them figure the percentage of cars counted that are red, blue, green, etc.

An additional activity of the same procedure may be done to determine the make and model of cars on the highway.

DECIMALS

Overview: Students will use decimals to measure distances that they travel.

Materials and Equipment: Paper, pencil, yardsticks for each group, and small pieces of paper to be drawn out of a hat with one of the following decimals written on each piece of paper: .21, .25, .31, .24, .11, .15, .18, .37, .34, etc.

Activities: Divide your class into several groups. Each group will be competing against the other groups. Take the groups outside to the football field and line them up on the 25 yard line. Each group will have to advance 75 yards to score.

Have each group draw from the hat a piece of paper with the decimal written on it. Each group is to calculate how far they are to advance toward the goal line by multiplying the decimal drawn by 75 yards.

The object of the exercise is to be the first group to score.

Each group is to take turns drawing from the hat and calculating the distance that they will advance until all groups have advanced the 75 yards. The exercise will be

won by the group that calculates correctly and draws the highest decimals.

Example: Group A

```
  75
x .24
 800
 150
18.00
```

Group A will move 18 yards. They are now on the 43 yard line.

An additional activity: Do the same exercise but multiply the decimals found on the pieces of paper by the remaining distance to the goal.

In this exercise none of the teams will score, so the winner is determined by the closest group to the goal line.

FRACTIONS

Overview: Students will use fractions to measure the distances that they can throw objects.

Materials and Equipment: Paper, pencil, baseball, softball, basketball and football

Activities: Take your class outside to the football field. Have each student throw all of the balls from the goal line one at a time and measure the distance that each ball travels in the air by fractions.

Examples: baseball $\frac{70}{100} = \frac{7}{10}$ softball $\frac{55}{100} = \frac{11}{20}$

basketball $\frac{23}{100}$ football $\frac{30}{100} = \frac{3}{10}$

Using the reduced fraction for each distance, have the students add the fractions and determine the total distance that all balls were thrown. $\frac{7}{10} + \frac{11}{20} + \frac{23}{100} + \frac{3}{10} = \frac{178}{100} = 1\frac{39}{50}$ of a football field or 178 yards.

Other problems that the class might enjoy working are: What was the average distance of each throw? How far did the entire class throw each ball and what was the total distance of all of the balls thrown?

FRACTIONS

Overview: Students will use fractions to obtain the score of a football game between team A and team B.

Materials and Equipment: Paper and pencil

Rules: A touchdown occurs when the team with the ball goes over the goal line. The field is 100 yards long. A touchdown counts 6 points.

Activities: Take your class outside to the football field and have them answer the following statements:

Team B on the 40 yardline kicks to team A. The kick is caught on the opposite end of the field on the yardline that is $\frac{1}{10}$ the distance of the field. They are on what yardline? (10 yardline)

What fractional part of the football field did the ball travel over when kicked? ($\frac{1}{2}$)

Team A returns the ball $\frac{1}{5}$ the distance of the kick. They are on what yardline? (20 yardline)

Team A runs the ball to a yardline that is $\frac{1}{2}$ the distance of 10 yards. They are on what yardline? (25 yardline)

Team A throws a completed pass for $\frac{2}{5}$ of $\frac{1}{2}$ the distance of the field. They are on what yardline? (45 yardline)

Team A runs around right end for twenty yards and fumbles the ball at that spot. The ball bounces back $\frac{1}{10}$ the yards run and is recovered by team A. They are on what yardline? (37 yardline)

Team A drives up the middle for 3 yards. They are on what yardline? (34 yardline)

Team A throws a pass that is $\frac{4}{17}$ of the distance to the goal. They are on what yardline? (26 yardline)

Team A now has a first down. On first down they move the ball $\frac{3}{5}$ of the distance needed to make a first down. They are on what yardline? (20 yardline)

On second down team A moves the ball $\frac{1}{2}$ the distance needed for their first down. They are on what yardline? (18 yardline)

On third down team A moves the ball $\frac{1}{3}$ the distance between them and the goal. They are on what yardline? (12 yardline)

Team A throws a pass that is $\frac{3}{25}$ of the distance of the field. They are on what yardline? (Touchdown)

When students have completed this activity, have them write a similar description of team B scoring a touchdown.

FRACTIONS

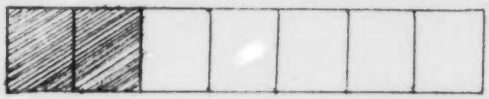
Overview: Students will become acquainted with fractions by designing and constructing shaded blocks and circles on the school sidewalk.

Materials and Equipment: Rulers, paper, pencils, paint and brushes

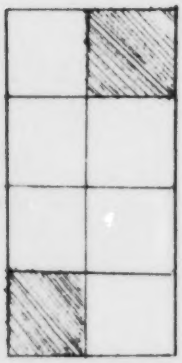
Activities: Students will first design, construct and label shaded blocks and circles on paper to depict different fractions. Then they will duplicate these designs on the school sidewalks with paint. The size of these designs can vary.

Examples:

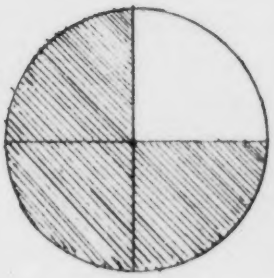
$\frac{1}{4}$



$\frac{2}{7}$



$\frac{2}{8}$ or $\frac{1}{4}$



$\frac{3}{4}$

GRAPHS

Overview: Students will be involved in a practical experience that will use different types of graphs.

Materials and Equipment: Paper, pencil and tree identification book.

Activities: Take the class outside and have them make a list of all the trees found on the campus, their kind and the number of each kind. Then have the students construct a line graph and bar graph that depicts the kind and number of trees found on the campus.

RATIO

Overview: By measuring the shadow of a tree, the height of that tree can be figured by using ratios.

Materials and Equipment: Yardstick or meterstick, paper and pencil

Activities: Measure the length of the trees' shadow. Place the yard or meter stick parallel to the tree and measure the shadow it casts.

$$\frac{\text{Tree's Height}}{\text{Tree's Shadow}} = \frac{\text{Stick's Height}}{\text{Stick's Shadow}} \quad \text{or}$$

$$\text{Tree's Height} = \frac{\text{Tree's Shadow} \times \text{Stick's Height}}{\text{Stick's Shadow}}$$

MODE, MEAN AND MEDIAN

Overview: Students will be involved in a practical experience that will use the different kinds of averages: mode, mean and median.

Materials and Equipment: Paper, pencil and tree identification book

Activities: Take the class outside and have them make a list of all the trees found on the campus, their kind and the number of each kind. Then have the students figure the mode, mean and median.

FINDING AN UNKNOWN

Overview: Students will use the square footage of an area plus the length of one side of a rectangle to figure the other side.

Materials and Equipment: Paper, pencil and measuring tape.

Activities: You have been given 45,000 square feet of artificial turf to be used on an area that is 300 feet long. What will be the width of the field? Measure a field of these dimensions: W = Width

$$W \times 300 = 45{,}000$$

$$W = \frac{45{,}000}{300}$$

$$W = 150$$

USING REAL NUMBERS

Overview: Students will become acquainted with how real numbers can be used to measure temperature.

Materials and Equipment: Paper, pencil and an outside thermometer

Activities: Have the students record the temperature changes outside each hour for eight hours. If the temperature increases 2°, have them write $+2^{\circ}$. If the temperature decreases 2°, have them write -2°.

Example:

Hour	1st	2nd	3rd	4th	5th	6th	7th	8th
Temperature Change	$+3^{\circ}$	$+2^{\circ}$	$+1^{\circ}$	0°	$+1^{\circ}$	-3°	-2°	-5°

If they had measured the temperature change from the beginning of the first hour to the end of the eighth hour, what change would they have recorded? (-3°)

CREATING THROUGH PATTERNS

Overview: Students will become acquainted with the patterns in nature that have common geometric shapes.

Materials and Equipment: Paper and pencils

Activities: Take the students outside and have them look for and sketch objects that are found in nature that have common geometric shapes.

Examples:

Tree trunk - cylinder

Leaves - oval

Cedar tree - cone

Two trees - parallel lines

Sky - half sphere

A tree leaning against another - triangle

Composite flowers - circle

Bee hive - hexigon

Walnut - sphere

Triangle stem - sedge

GEOMETRIC FIGURES

Overview: This lesson is designed to teach students to become more aware of the geometric figures that are all around them.

Materials and Equipment: Pencil and paper

Activities: Take the students outside and have them list all of the geometric figures that they know. Then have them find an object preferably in nature that depicts each geometric figure listed.

PATTERNS

Overview: Students will develop a table that will depict a mathematical pattern.

Materials and Equipment: Paper, pencil and string

Activities: Take the class outside and have them sit in a circle. Stretch the string across the circle to form two parts in the circle. Stretch a second string across the circle to form four parts in the circle. Stretch a third, fourth, fifth and sixth string across the circle. Each time the string is stretched across the circle try to form the maximum number of parts formed.

Ask the students to draw a chart and determine the mathematical pattern that is developed.

Number of Strings	Number of Parts
0	1
1	2
2	4
3	7
4	11
5	16
6	22

SIMILAR TRIANGLES

Overview: Students will use similar triangles to measure the height of a tree.

Material and Equipment: Paper, pencil, tape measure and a cardboard isosceles right triangle (approximately 8 inches long on the equal sides.)

Activities: Hold the triangle at eye level with one side parallel to the ground. Sight along the hypotenuse. Back away from the tree until you sight the top of the tree. Measure the distance from the place where you are standing to the bottom of the tree. The height of the tree is this measured distance plus the height of your eye from the ground.

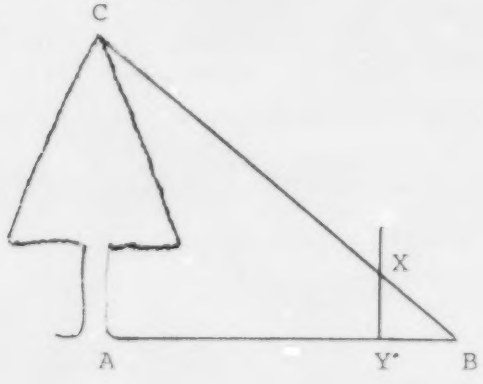
SIMILAR TRIANGLES

Overview: Students will use similar triangles to measure the height of a tree. They will compare corresponding sides in a ratio problem.

Materials and Equipment: Ruler or meter stick, a straight 10 ft. pole, pencil and paper

Activities: From the base of a tree (a) walk eleven steps or measure eleven units and mark the point (Y). With the 10 foot pole perpendicular to the ground, take one more step or measure one more unit and mark that point (B). With your head on the ground at point (B), sight past the pole to the top of the tree (C). Where your line of vision intersects the pole, place a mark with your pencil (X). Measure from point (X) to point (Y) in inches. The number of inches will be directly proportionate to the height of the teee in feet. The similar triangles are ABC and YBX.

$$\frac{YB}{AB} = \frac{YX}{AC} \quad \text{or} \quad \frac{1}{12} = \frac{YX}{AC}$$



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SIMILAR TRIANGLES

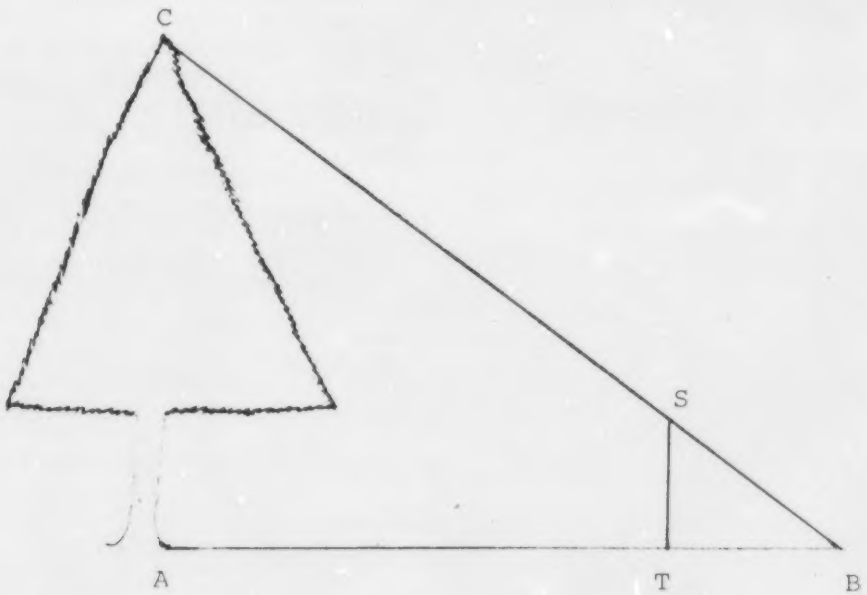
Overview: Similar triangles will be used to measure the height of a tree. The corresponding sides will be compared in a ratio problem.

Materials and Equipment: Tape measure, 5, 6, 7 or 8 foot straight stick, paper and pencil.

Activities: Place the stick perpendicular to the ground 30 feet or more away from the trunk of the tree. With your head on the ground sight over the top of the stick to the top of the tree. Divide the distance from your eye to the tree by the distance from your eye to the stick. Then multiply your answer by the stick's height. This answer will be the height of the tree.

$$\frac{AB}{BT} = \frac{AC}{ST}$$

$$AC = \frac{ABST}{BT}$$



ISOSCELES TRIANGLE

Overview: Students will make an isosceles triangle on the campus by making two equal right triangles. The hypotenuse of one triangle will be congruent to the corresponding hypotenuse of the second triangle.

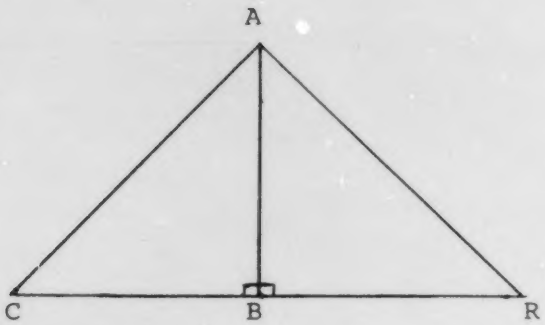
Materials and Equipment: String, tape measure, four wooden stakes and a square piece of cardboard

Activities: Drive a stake in the ground to represent point (A). At a distance of 40 feet from (A) drive a stake into the ground to represent point (B). Using the cardboard square to make a right angle place stake (C) 15 feet from (B). It will be perpendicular to line (AB). Stretch string from stake (A) to (B) to (C) to (A). A right triangle will be formed.

To form an isosceles triangle, make another right triangle using line (AB) as one leg. Using the cardboard square to make a right angle place stake (F) 15 feet from (B). It will be perpendicular to line (AB). Stretch string from (B) to (R) to (A).

Triangles (ABC) and (ABR) are congruent. Using leg AB in common the hypotenuse of each triangle form the two equal

legs of the isosceles triangle (ACR).

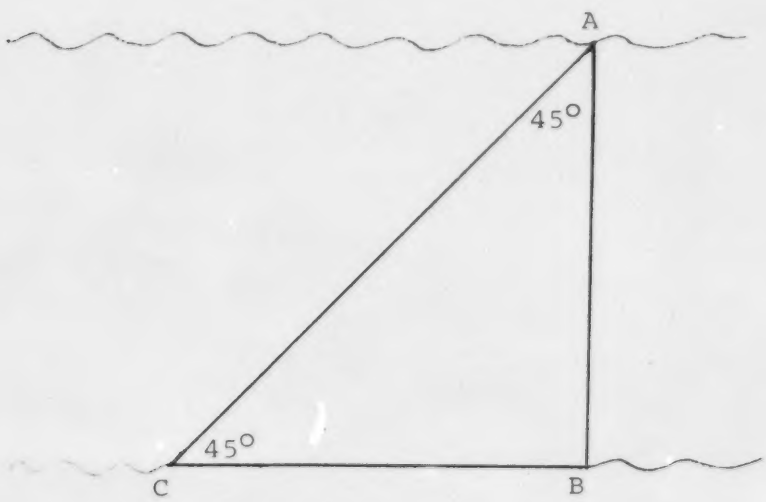


ISOSCELES RIGHT TRIANGLE

Overview: Students will use an isosceles right triangle to measure the width of a stream.

Material and Equipment: Paper, pencil, tape measure and a compass

Activities: Stand on the bank of a stream (point B). Sight an object directly across the stream on the opposite bank (point A). Walk in a straight line perpendicualr to line AB, either up or down stream. Using your compass find point C which will be 45°. Measure the distance from point C to point B. This distance will be equal to the distance from point B to point A.



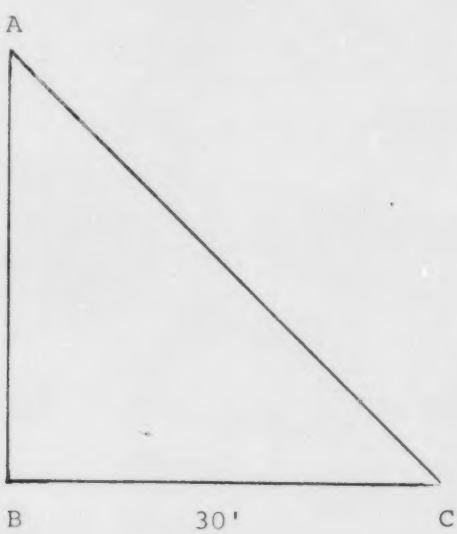
ISOSCELES RIGHT TRIANGLE

Overview: Students will make an isosceles right triangle on the campus.

Materials and Equipment: String, three wooden stakes, a square piece of cardboard, and a tape measure

Activities: Drive a stake into the ground to represent point (A). At a distance of 30 feet from (A) drive a stake into the ground to represent point (B). Using the cardboard square to make a right angle, place stake (C) 30 feet from (B). It will be perpendicular to line (AB).

Stretch the string from point (A) to (B) to (C) to (A). An isosceles right triangle will be formed.



TANGENT

Overview: Students will use the tangent of a right triangle to determine how far away an object is from the base of a building. The object is sighted from the second floor. The angle of depression will be used.

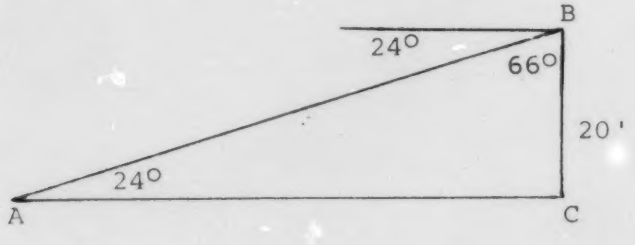
Material and Equipment: Paper, pencil, measuring tape, transit

Activities: From second floor window of a building have the students pick out an object on the ground. The right triangle ABC would be formed if a line were drawn from the object to the base of the building to the second floor window and directly back to the object on the ground.

Using a transit at the window determine the angle of depression. Also measure the distance from the transit to the ground.

Example:

$b = a \tan B$



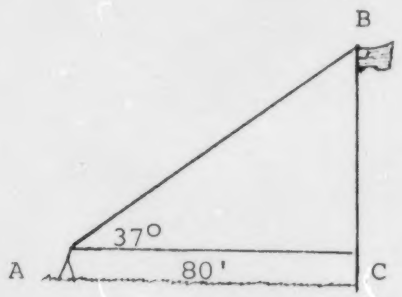
TANGENT

Overview: To solve the following right triangle problem, the students will use the tangent of acute angle A to measure the height of an object.

Material and Equipment: Paper, pencil, tape measure, transit and flagpole or other tall object

Activities: Take the class outside to the flagpole. Using the transit that is set on 37°, have the students walk away from the base of the flagpole until the transit setting lines up with the top of the flagpole. Measure the distance from the center of the flagpole (find the radius) to the transit (example 80 feet). Now have the students set up the formula for finding the height of the triangle formed.

$a = b \tan A$



Remember, that you will have to add the height of the transit above the ground to side a to obtain the height of the flagpole.

This method can be used to measure the height of trees, buildings, towers, etc.

TANGENT

Overview: Students will use the tangent of an acute angle A to measure the width of or distance across an object.

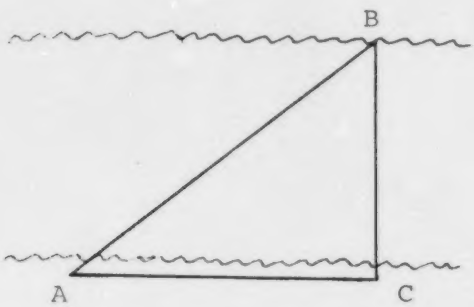
Materials and Equipment: Paper, pencil, measuring tape, transit or magnetic compass

Activities: Stand on the bank of a stream (point C). Sight an object directly across the stream on the opposite bank (point B). Walk in a straight line perpendicular to line BC, either up or down stream, to any point you choose (point A). Using your compass or transit figure the angle that is formed at point A where lines AB and AC intersect.

Measure the distance from A to C.

Now have the students set up the formula for finding the height of the triangle formed.

$a = b \tan A$



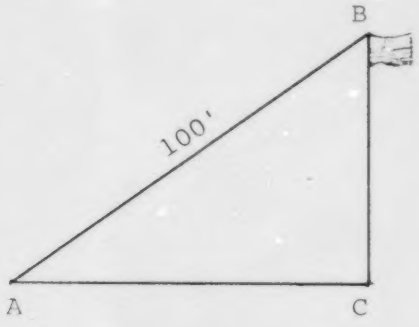
COSINE

Overview: To solve the following right triangle problem the students will use the cosine of acute angle A to measure an unknown distance.

Materials and Equipment: Paper, pencil, 100 foot string, tape measure, transit and a wooden stake and hammer.

Activities: Take the class outside to the flagpole. Using the flagpole rope, tie the 100 foot string to it and run the string to the top. Then walk away from the pole holding string until the end of the string barely touches the ground. Tie this end to the wooden stake and drive it into the ground. Right triangle ABC has been formed with an hypotenuse of 100 feet.

Using the transit measure angle A. Now have the students figure the distance from A to C using the formula $b = c \cos A$.



When checking your answer don't forget to include the radius of the flagpole in the distance from A to C.

SINE AND COSINE

Overview: To solve the diagonal distance of a rectangle students will use the sine of acute angle A.

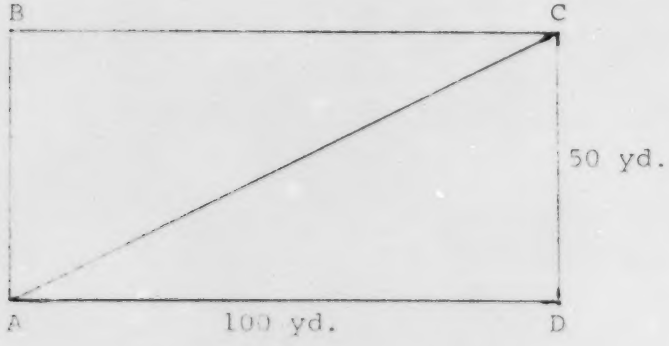
Material and Equipment: Paper, pencil, measuring tape, transit or magnetic compass

Activities: Take the class to the football field. Using the corners of the football field as points ABCD, have the students figure the distance from A to C.

Use the compass or transit to figure the angle that is formed at point A where lines AD and AC intersect.

Knowing the length (100 yards) and the width (50 yards) of a football field, either of the following formulas could be used to find the diagonal of the football field.

$$d = \frac{a}{\text{Sin } A} \qquad d = \frac{b}{\text{Cos } A}$$



SINE, COSINE AND TANGENT

Overview: Students will learn through a practical experience how the sine, cosine and tangent of acute angle A can be used to find the perimeter of a triangle.

Materials and Equipment: Paper, pencil, measuring tape, transit or magnetic compass, a ball of string and three wooden stakes

Activities: Take the students outside and have them determine how many feet of string will be needed to construct a right triangle if the longest side is 100 feet and the smallest angle contains 42°.

Starting at point A (drive a stake) measure 100 feet to point C (drive a stake). Using a compass or transit shoot an azimuth of 42° from point A. Point B (drive a stake) will be established where lines AB and BC intersect. BC is perpendicular to line AC.

Stretch the string around the stakes to form the right triangle ABC.

Now have the students set up the formulas needed to figure the perimeter of the triangle.

$a = b \tan A$, $c = \frac{a}{\text{Sin } A}$, etc.

To prove the students' work, have them measure how many feet of string they used.

GIVING DIRECTIONS

Overview: To show the student a need for clear and accurate description in giving directions.

Materials and Equipment: Paper, pencil, materials to be hidden.

Activities: Divide the class into four or five groups. Each group is to go to a different part of the school area. Give each group a different object such as pencil, crayon, scarf. Using description and direction only, each group will write a map, which should lead to the hidden object. Students are to use only natural landmarks in giving directions. For example, the map might begin with "twenty steps from ticket booth at north entrance of stadium". After maps are completed, or you may give a time limit of twenty-five minutes, students exchange maps. Each group tries to find the hidden object by following the written descriptions and directions. The group that gives the best directions might be given a prize of some kind such as a coke, candy, etc.

PARTS OF SPEECH

Overview: This lesson is designed to be used as one of the culminating lessons on a unit on parts of speech. After working several practices on recognizing and using the eight parts of speech, the student should enjoy going outside and finding nature objects and using them to reinforce his knowledge of the parts of speech.

Materials and Equipment: Students will need to take with them paper and pencil to the outdoor classroom.

Activities: Letter your paper A through Z. As you walk through the woods along a nature trail, find one example of objects in nature for each letter in the alphabet. You will be allowed 15 minutes to complete the list. You must see the objects you include in your list. At the end of the 15 minute period, be prepared to read your list and give an adjective to describe each word you included in your list.

After finishing the above activity, divide the words into syllables, placing the accent marks where they belong.

After finishing the above activity, categorize your list under these headings: Vegetable, Mineral, Animal

Questions:

1. A. What part of speech is each word you used in activity one?

B. How did you know?

C. What is an adjective?

D. Why is it an important part of speech?

2. A. What is a syllable?

B. What must each syllable contain?

C. What is an accent mark?

D. Does a word ever have more than one accent mark?

E. What are they called?

3. A. Why is it important for a student to be able to organize words or materials?

B. What would the world be like with on organization?

NOUNS

Overview: Students will learn to recognize and become acquainted with the different kinds of nouns.

Materials and Equipment: Paper and pencil

Activities: As a beginning assignment take the students outside and have them make two lists of the things they see. One list should contain the proper nouns and the other the common nouns.

For a more indepth study of nouns, ask the students to place these nouns into the following categories: concrete nouns, abstract nouns and collective nouns.

As a culminating activity have the students write sentences using the nouns that are listed in each of the above categories.

ADJECTIVES

Overview: To teach students to become more observant of things seen in nature. Students will increase their descriptive power as well as their vocabulary.

Equipment and Materials: Paper and pencil

Activities: Take the students outside. Pick out an object in nature and describe it with ten adjectives that begin with the same letter of the alphabet.

ADVERBS TO PREPOSITIONS

Overview: This exercise is an attempt to help students realize that direction or location adverbs may become prepositions when complemented or completed by an object which is either a noun or pronoun.

Materials and Equipment: Paper and pencil

Activities: Take the students outside and have them make a list of 15 direction or location adverbs. Then have them complete these adverbs with an object found in nature.

Tell the students that a preposition is anything a squirrel can do with a tree.

Examples: The squirrel had to go in the den.
The squirrel likes to go down the tree.
Squirrels have run around the house.

A direction or location adverb plus an object becomes a preposition phrase. Thus, the adverb becomes a preposition when complemented or completed by the object.

THE PREPOSITIONAL PHRASE

Overview: To enable the student to identify the preposition as one of the eight parts of speech and use it in his writing.

Materials and Equipment: Paper and pencil

Activities: Put a list of prepositions on the board. Ask the students to experiment with two or three different prepositions in each blank below to complete the phrase.

1. outside the room
2. over the moon
3. upon the floor
4. into the school
5. for my friend
6. against the window
7. after that day
8. by the people

After the exercise is completed, have students go outside, choose an object, living or nonliving, write down all the prepositions that can be used with the object to form prepositional phrases. Then have the class write a story using their prepositional phrases.

SPELLING

Overview: Using their own vocabulary, students will identify things in nature, write them on paper and learn to spell them.

Materials and Equipment: Paper, pencil, construction paper, manilla paper, crayons, magazines, glue, stapler, scissors, cardboard strips, magic marker

Activities:

1. Go outside on the school campus, have the students take a piece of paper and write the letters of the alphabet on the left margin of their paper. Then have them write words of things they see in the out-of-doors that begin with each letter in the alphabet.

After working for some time, sit down and have them tell what they wrote on their paper. Use each word in a sentence orally so they will have a better understanding of each word. Go back inside. Put the words on the board for correct spelling. The pupils will copy them down and study them.

Example Questions:

A. What word did you get for a? etc.
B. How many syllables does each word have?

2. Divide into groups. Make a picture dictionary for the room of things they saw. Either draw while in the out-of-doors or hunt up pictures of each thing they put down for each letter.

The second group will make up jingles or nonsense sentences using the words such as: The acorn saw a bee laughing with the oak tree.

The third group will make cards and leave off the first letter of each word and see who can identify the word.

DEFINITIONS

Overview: Students will learn how to define objects found in nature. Learning how to make correct definitions will help students to think logically and to express themselves accurately.

Materials and Equipment: Paper and pencil

Activities: Take the students outside to make a list of objects found in nature. Then have them define the words using the three steps listed below.

1. Name the word to be defined.
2. Name the general class to which it belongs.
3. Name the characteristics that make it different from all others in its general class.

Word Defined	General Class	Particular Characteristics
Grass is	a plant	with jointed stems.
The sun is	a star	that gives warmth to the earth.

DESCRIPTIVE COMPARISONS

Overview: Students will learn how to compare one object with another object that is found in nature. By detecting the similarities and differences the students will learn how to become more observant.

Materials and Equipment: Paper and pencil

Activities: Each student will pick a different tree on the campus if possible. Then have them make a list of adjectives that describe their tree.

Without telling the name of their tree the students will compare their list with a fellow classmate. From the comparisons the class should be able to construct a tree key.

A UNIT IN DESCRIPTIVE WRITING

Overview: The students will increase their adeptness to describe objects through the use of their senses. Not only will they be able to describe these objects orally, they will also improve in detail and vividness the ability to express these ideas in writing.

Materials and Equipment: Paper, pencil, camera (if desired) paints, magic markers, art paper

Activities:

1. Write ten sentences on the board. Write some with adjectives and some without to illustrate the necessity for description.

2. For an overnight or perhaps a longer period assignment, let students observe an article in the outdoors. Perhaps time for extended observation will be allowed. Then ask students to write a descriptive paragraph about this object and request that at least 3 vivid adjectives be used in each sentence.

3. Paragraphs could be read aloud in class and perhaps interested students would like to illustrate these descriptions.

Questions:

1. How do we convey a message?
2. How do we convey an image?
3. By looking outdoors, what parts of speech do you see typified?
4. What makes up our outdoors?
5. What is the best way to become familiar with a person, place, or thing?
6. What part of speech is necessary to give detail and individuality to an object?
7. What makes everything and everybody different although we often fit into categories?

SENSORY LANGUAGE

Overview: To teach the slow learning student to use sensory language. Sensory language communicates with picture words instant images. The poor student can understand the meaning of "a picture is worth a thousand words."

Materials and Equipment: Paper, pencil and worksheet

Activities: Ask class to form groups of three or four students each for the purpose of visiting a place in the community and recording multiple sense impressions. Record things actually seen, tasted, hears, smelled and touched on a worksheet. Excellent places to make a record of sense impressions are: a wooded area, the school cafeteria, near an industrial plant, a busy street corner, and on the school playground.

Ask each group or each individual to make a record while actually visiting the place. Then have them write sentences depicting what they saw, heard, smelled or touched. As a follow-up activity you may want the students to write paragraphs or a story using the words.

Work Sheet

Place _____ Time _____

Things I Saw	Things I Heard	Things I Smelled	Things I Touched

OBSERVING AND DESCRIBING

Overview: This lesson is one which is designed to introduce a unit on descriptive writing. Throughout history man has been recording and recreating the essence of nature in his writing. Writing can help man to enjoy life more by sharpening his senses to the world around him. This lesson focuses mainly on the important senses of hearing and seeing. The students will be encouraged to use observing as a key to learning. Experiences will be provided which will hopefully cause the students to change from "passive lookers" to "active seers." The students will be given an opportunity to share their observances through vivid, sense-arousing descriptions.

Materials and Equipment: Worksheets and pencils

Activities: Take the class outside and have them do the worksheet.

Questions:

1. A. Are there some things you have looked at hundreds of times but have never really seen?
   B. What did you see on your way to school this morning?
   C. What did you hear when you woke up this morning?
2. A. Was your sense of hearing more keen with your eyes closed?
   B. Why do you think this is true?
   C. What two elements must each sentence contain?

3. A. Did you have an difficulty in writing 20 questions about the object you chose?
   B. What did you observe about your object that you might have missed if you were making a routing observation?
4. A. If you knew you were going to lose your sight tomorrow, what would you want to see today?
   B. Do you think man takes his sense of sight for granted?

Student Worksheet

1. Answer the following questions from memory. If you are not sure of the answer, guess and investigate later.

   A. What color is the top stripe of the American flag? The bottom stripe?

   B. How are the stars arranged?

   C. Don't look now, but are there any framed pictures in your English classroom? How many? What are their subjects?

   D. Whose picture is on a penny? What words are on the picture side of the coin? On the other side?

   E. What trees, bushes, and plants are there in front of your house?

2. Close your eyes and remain absolutely silent for one minute and listen to the various sounds. At the end of the minute, write a sentence indicating what you have hears.

3. Choose some object, such as a tree, a stream of water, etc., and write twenty questions about this object. Be prepared to read this list of questions and choose one of the questions to list procedures to follow in solving it.

4. On your way home tonight or on your way to school tommorrow morning, pretend that you are about to lose your sight. Choose one picture worth remembering - an object, a person, a happening. As you prepare to describe the picture to

your classmates, note the details that will bring it clearly to mind. Then in class tomorrow write a vivid description of what you saw.

USING ALL FIVE SENSES IN WRITING

Overview: This lesson is designed to cause the students to realize the importance of using all five of their senses as resource material for their writing exercises. Students need to be taught to use not only their eyes but also their ears, their noses, their taste buds, and their sense of touch. Interest in the lesson can be created by the use of a poster entitled "What is Your S T S T S Rating?" Do you use your senses: Sight, Taste, Smell, Touch and Sound?

Materials and Equipment: Paper, pencil and a poster prepared by the teacher on the five senses.

Activities:

Section I: Divide your paper into sections for the five senses (sight, sound, smell, taste, touch). In the outdoor classroom make observations and list them under the proper headings. After spending 15 minutes observing and filling in the chart, choose one of the senses and develop a paragraph about your observations.

Section II: Choose some object around your home to observe for a week. Visit this object at least once a day at different times during the day and write a diary-type report on your observations. Entitle your report "My Place" and indicate

the date and the time of day each observation was made.

Questions:

Section I:

1. How are some ways we can use our senses in observation?
2. How can your senses aid you in creative writing?
3. Do you have any observations on your chart of which you were not aware?
4. Which is the easiest of the five senses to describe? Why?

Section II:

1. Were you aware that objects in nature change from day to day?
2. Do you think you will be more aware of your environment now?

DESCRIPTIVE WRITING

Overview: This lesson is designed to be used to show the student that writing can be fun when he uses the out-of-doors as an unlimited source of writing material. It can also be used to reinforce the method of using comparisons as one of several important ways to develop a paragraph.

Materials and Equipment: Students will need to carry with them pencil and paper to the outdoor classroom. The teacher will prepare a poster to use in presenting the method of using comparisons and contrasts to develop a paragraph.

Activities:

Section I: As you are sitting in the outdoor classroom, think of an animal that you could pretend to be. Think about this animal considering his habitat, his actions, his eating habits, etc. Write an essay from the point-of-view of the animal. For example, you might choose to describe a day in the life of the animal or you might choose to describe a frightening experience involving this animal.

Section II: After you have finished Section I, compare this animal with another animal from a similar region. This activity should be written in a short paragraph.

Questions:

1. What is the difference in an essay and a paragraph?
2. Does each sentence have a topic sentence?
3. What is a topic sentence?
4. When one uses comparison to develop a paragraph, what does he do?
5. When one uses contrasts to develop a paragraph, what does he do?
6. What are some of the other methods one might use to develop a paragraph?

SHORT STORY

Overview: Students will be involved in writing a short story in a natural setting.

Materials and Equipment: Paper and pencil

Activities: Take the students to a natural outdoor setting. Have them write a short story that takes place in that setting. The contents and theme of the short story should use the setting to the fullest.

SENTENCES

Overview: This lesson is designed to emphasize sentences that are classified as to form - complex, compound and simple; and sentences that are classified as to meaning - declarative, exclamatory, imperative and interrogative.

Materials and Equipment: Paper and pencil

Activities: Take the students outdoors and have them write sentences about things they observe under both classifications mentioned in the overview. The students should write at least one sentence in each category.

LETTER WRITING

Overview: This lesson is designed to be used after the class has visited an old farm site such as the Overton Farm near Hodges, Alabama. It will provide the opportunity for the students to utilize their observations and to gain practice in the correct procedure to follow in writing a letter. The teacher through prepared posters on letter writing will emphasize the parts of a letter, the correct punctuation to be used, margin requirements, etc.

Materials and Equipment: Paper, pencils and a poster on letter writing.

Activities: After a visit to the Overton Farm, pretend that you are Abner Overton. Write a letter to your grandson, William Thomas, who was born in 1885. Describe your life in Frontier America. Remember that Abner was born in 1800 and acquired the 160 acre farm in 1817. Abner died in 1877 before William was born. Be sure to use only those historical events occurring between 1817-1877. Use your imagination as you describe what life was like for Abner and his family. You might choose to use some of the information you acquired on your visit to the Overton Family Cemetary.

Questions:

1. Why is it important for students to learn to write letters?
2. What are some kinds of letters a student will need to know how to write?
3. What kind of letter did you write in the activity on the Overton Farm?

ABRIDGED READERS' GUIDE

Overview: This lesson is designed to lead students to a wealth of material about the outdoor environment which may never appear in books or which has been newly published. The Abridged Readers' Guide will be explained in the "outdoor classroom" with respect to arrangement, types of entries, and parts of an entry. In the "outdoor classroom" a discussion about the need for using magazines and magazine indexes in the study of the outdoor environment will lead students into participation through questions such as:

1. How would you locate information in the Abridged Readers' Guide on animals, air pollution, conservation, snakes, etc.?
2. Why are good magazines useful in the study of the outdoor environment?
3. How many magazines can you name that contain articles about the outdoor environment?

Materials and Equipment: Pencils, copies of the Abridged Readers' Guide, enlarged examples of entries in the Abridged Readers' Guide that will be utilized by the librarian and worksheet.

Activities: Give the class a worksheet and take them outside to complete it.

Questions:

1. How many articles were listed under the subject you choose to look up?
2. How many different magazines were mentioned in the separate entries.
3. How many of the articles did not have authors? Why did these articles not have authors?
4. What advantages are there in using magazines instead of books in locating material on the outdoor environment?

STUDENT WORKSHEET

I. As you walk around in the "outdoor classroom" list ten objects which you observe.

1. 6.
2. 7.
3. 8.
4. 9.
5. 10.

II. Arrange the objects you observed in the "outdoor classroom" in alphabetical order below.

1. 6.
2. 7.
3. 8.
4. 9.
5. 10.

III. The ten objects you observed in the outdoor environment can be located in the Abridged Readers' Guide. Select one of the objects you observed in the "outdoor classroom" and locate an entry for that subject in the Abridged Readers' Guide. Complete the following:

1. Who is the author of the magazine article?
2. What is the title of the magazine article?
3. On what page is the article located?
4. What is the volume number of the magazine?
5. In what magazine is the article located?
6. What is the date of the magazine in which the article is located?

A STUDY OF ROLE-PLAYING THROUGH THE STUDY OF NATURE

Overview: After a nature walk involving an entire class period, students will be given a chance to do role-playing and express this role in the form of a "reason" composition.

Materials and Equipment: A guide if an unfamiliar site is chosen. Paper, pencil, magnifying glass, microscope, containers, insect repellant, comfortable clothes, transportation, if necessary.

Activities: Remind the students to pay close attention to everything on the walk. It might be interesting to wait until the class returns from walk to make the assignment, but preferably tell students beforehand what will be expected of them.

Ask students to choose one object, whether animal, vegetable or mineral and tell in a theme why they would like to be that item for one day. If necessary, students might like to collect items pertaining to the subject of their paper.

Emphasize the contents of a "reason" paper. It should answer such questions as why, what you would do differently, and how you'd like to be treated, and where you'd rather be, and what you would look like and do for a living. Emphasis should also be put on why it would be better to be that object than a student or a person in general.

CINQUAIN POETRY

Overview: To enable the student to realize that poetry can be a simple way to express his feelings and ideas.

Materials and Equipment: Paper, notebook

Activities: Explain the meaning of cinquain poetry. Have students choose a partner. Use this form to write cinquain.

Line 1 one word - parnter's name

Line 2 two words - descriptive words

Line 3 three words - action words

Line 4 four words - personal feelings

Line 5 one word - synonym for partner's name

After students do this exercise, have them go to Ford's Mill Pond which is about five blocks from school. Observe the area of the old mill and write a cinquain about it. The students could collect this type poem and illustrate as a book.

STUDY OF ROBERT FROST THROUGH NATURE

Overview: This lesson is designed to let students experience the same feelings Frost had when writing his poetry. The purposes are to insure the relation between Frost and the soil or nature in general and to let students explore the possibilities for the different types, forms, and lengths of poems.

Materials and Equipment: Copies of different Robert Frost poetry, trips to the out-of-doors including woods, streams, and other areas. Pencil, paper, a knowledge of Frost's interests, including some aspects of his life.

Activities:

1. Take students on a hike, perhaps to a nearby stream, to a woody area, or just out-of-doors.
2. Ask students to pay close attention to items including their color, sound, locale, function, and other possibilities for enjoyment.
3. Let students choose one item that particularly appealed to them and write a poem about this article as they see it.
4. Remind students that a poem does not have to rhyme or have a set number of lines or definite rhythm.

Questions:

1. What type of poems did Robert Frost write?
2. Why did he stick to one type of subject matter primarily?

3. What title is associated with the man Robert Frost?

4. What sense impressions does Frost attempt to relate to his reader?

5. Does he succeed in this attempt?

6. What childhood pasttime did he enjoy as a young boy?

7. As a young child, what can you remember enjoying about the out-of-doors?

8. Were all of Frost's poems serious?

ENJOYING POETRY

Overview: This lesson is designed to help the student understand that poetry is really just painting word pictures. Poetry is full of images - vivid descriptions that make you see what the poet wants you to see. To paint these word pictures, the poet frequently uses comparisons. For example, you may never have seen an army approaching, but you begin to see it in imagination when the poet compares it to a swarm of bees or a gathering storm.

Materials and Equipment: Worksheet, pencils and a poster that illustrates the simile and metaphor in poetry.

Activities: Take the class outside to do the worksheet. Discuss with them the similes and metaphors found in poetry that are written about the out-of-doors. Have the class write a poem depicting what they see using similes and metaphors.

Questions:

1. Why is poetry an important tool of the writer?
2. Why is poetry most effective when it is read aloud?
3. In what way is poetry closely related to music?
4. Why do you think most students do not understand poetry?
5. How can one learn to enjoy reading poetry?
6. What is the difference in a simile and a metaphor?
7. What are some rules one must remember when he writes poetry?

WORKSHEET

I. In each of the following what two things are compared? Is the comparison a simile or a metaphor? Follow the form in the example as you answer these questions.

Example: A heavy fog erased the treetops. (Type of comparison metaphor)

What is being compared? (fog and an eraser)

1. March is a tomboy with tousled hair and mud on her shoes.

2. My thoughts this morning are as tangled as my hair. LADY HORIKAWA

3. The road was a ribbon of moonlight. ALFRED NOYES

4. There is no frigate like a book to take us lands away. EMILY DICKENSON

5. He was as restless as a windshield wiper.

6. Do you hear the rain tap-dancing on the roof?

II. Write a poem of five to ten lines about a moment in a particular place. In each line use an image appealing instantaneously to the senses. Try to include each of the following in your poem:

1. Time of day

2. Season of the year

3. Particular Place

4. Color words, sound words, action words

5. An image in each line

6. No use of rhyme

7. A simile if possible

8. A metaphor if possible.

A STUDY IN SYLLABICATION AND CREATIVE POETRY

Overview: This study will encourage the recognition of syllables in words and the description and categorizing of our surroundings. This recognition will be illustrated through the use of Haiku poetry.

Materials and Equipment: Paper, pencils, paints, colors and directions for writing Haiku poetry.

Activities:

1. Introduce activity by a display of illustrated Haiku poetry on bulletin board. (Could be writings of previous classes, the teacher's or perhaps poetry out of anthologies.)

2. After introducing this type of poetry, explain the syllabication rules of Haiku poetry. Example, first line has 5 syllables, second line has 7 and third line has 5.

3. Emphasize the fact that Haiku poetry is a type of Japanese nature poetry.

4. To assure the awareness of syllables, have a short drill on words with 1, 2, 3 or even more syllables. Some suggested words might be beau-ti-ful, lone-ly, pret-ty, des-ert, grace-ful-ly, and short.

5. The above drill could be done outdoors. If it wasn't take students out-of-doors, possibly to a lake, waterfall, wooded area, or the football stadium.

6. Let the students find an appealing scene and ask them to try the techniques of Haiku poetry.

7. After all students have finished, ask them to read aloud their poetry.

8. If students enjoy this exercise, repeat it several times.

9. As a follow-up, the class could vote on the best poems and perhaps display them in the room, library, or even form a booklet.

10. Interested students might enjoy illustrating the poems.

ON THE ROMANTIC IDEA OF "ORGANIC FORM"

Overview: The students will study carefully the following poem by Walt Whitman. They will compare the poem with the leaves of a tree.

Materials and Equipment: Paper, pencils and worksheet

Activities: Take the students outside and sit down around a tree to do the worksheet. As they read the poem ask them to keep the following statement by John Keats in mind.

"If poetry comes not as natural as the leaves to a tree
it had better not come at all."

WORKSHEET

I SAW IN LOUISIANA A LIVE-OAK GROWING

I saw in Louisiana a live-oak growing,
All alone stood it and the moss hung down from the branches,
Without any companion it grew there uttering joyous leaves of dark green,
And its look, rude, unbending, lusty, made me think of myself,
But I wonder'd how it could utter joyous leaves standing alone there without its friend near, for I knew I could not,
And I broke off a twig with a certain number of leaves upon it, and twined around it a little moss,
And brought it away, and I have placed it in sight in my room,
It is not needed to remind me as of my own dear friends,
(For I believe lately I think of little else than of them,)
Yet it remains to me a curious token, it makes me think of manly love;
For all that, and though the live-oak glistens there in Louisiana solitary in a wide flat space,
Uttering joyous leaves all its life without a friend or lover near,
I know very well I could not.

1. Now study the leaves you see growing on the trees and try to think of them as poems. Discuss Whitman's poem in relation to this statement: As a leaf is produced by the tree's response to its environment, so a poem is produced by the poet's response to his environment.
2. What determines the form of a leaf? What, by analogy, should determine the form of a poem?
3. What does the word "naturally" mean in Keats' statement? When is the form of a leaf unnatural? When is the form of a poem unnatural?
4. What are some of the functions of the leaves on a tree? Whay, by analogy, are some of the functions of a poem?
5. When is a leaf complete? When is a poem complete? Is Whitman's poem complete? Why?
6. What are the difficulties of thinking of a leaf as an utterance? What are the difficulties of thinking of a poem as a palpable growing thing?
7. Pluck a leaf, examine it, and describe it as a poem.
8. Describe Whitman's poem as a leaf.

LANDFILL PROBLEM

Overview: This problem is designed to acquaint students with the size of an acre and the amount of land needed to operate a sanitary landfill. This problem involves division using decimals.

Materials and Equipment: Tape measure

Background: An acre contains 43,560 square feet and a football field is 300 feet by 150 feet.

Activities:

1. Have two students stand 209 feet apart. Have two other students walk at right angles 209 feet. They will form a square acre.

2. Figure how many acres there are in a football field to the nearest 100th of an acre (1.03 answer).

3. A sanitary landfill seven feet deep and one acre in surface area is needed each year for every 10,000 people in a community. Considering the population of Florence to be 35,000, how many football fields would be needed to hold our litter to a depth of 7 feet? (3.39 answer)

Questions:

1. What impact does garbage have on our lives?
2. What should we do with our garbage?
3. What can be recycled?
4. What can we do to eliminate the large amount of garbage that we have?
5. Is all garbage recyclable?

PLANNING A PIONEER HOME

Overview: The students will be given the opportunity to participate in selecting the site for a new settlement. They will realize the importance of the topography, climate, natural vegetation and resources.

Materials and Equipment: Paper and pencil

Activities: Take the students outside and have them select an area that they think would be suitable for a pioneer home. Then discuss some of the reasons for choosing that site.

1. What natural resources are available?
2. Is the soil suitable for row crops?
3. Can this position be defended from possible Indian attacks?
4. Is there an adequate water supply?
5. Is there an adequate wild game supply?
6. What will be your occupation?
7. What building materials are available?
8. Should any consideration be given to the location of the house as to the direction it faces?
9. Where should the barn be located?
10. How will you preserve your food?

MISUSE OF RESOURCES

Overview: The purpose of this activity is to make the student aware of the misuse of our resources.

Materials and Equipment: Paper and pencils

Activities: Carry your students on a trip around your area. Make a list of all the misuse of natural resources. After making a list of the misuse of resources, discuss ways to prevent misuse.

Questions:

1. What are some ways our natural resources are being misused?
2. What are we doing today to protect our resources?

Helpful Hints:

When Europeans first came to America they found a land of amazing richness. Forests were made up of trees grown to their fullest size. Streams ran cool and clear. Nutritious grasses grew waist-high on the prairies. Topsoil has formed undisturbed for centuries. Enormous mineral deposits lay beneath the surface.

Early settlers exploited these resources eagerly, often wastefully. The quantities seemed endless and few people thought of the future. The only important problems were how

to cut more trees, plow more land, mine more minerals, and kill more animals.

The world looks different to us today. Most intelligent people realize that even the most plentiful resources can become exhausted or can be so damaged that they become useless.

A STUDY OF LOCAL FOLKLORE
IN RELATION TO MEDICINAL USES OF PLANTS

Overview: Students are introduced to folklore and its meaning and further achievements that our own locality has made to its near past. Furthermore, students will be given experience in organizing a booklet illustrating what they have learned.

Materials and Equipment:

Leaves
Twigs
Plants
Glue
Construction Paper
Scissors
Poster Paper
Foxfire - Wigginton ed.
Magic Markers
Paint Colors
Staples
Paper
Pencil
Comfortable Clothing
Containers

Activities:

1. Introduce unit by reading excerpts from Foxfire on medicinal plants.

2. Guest speaker might include downtown physician, forest ranger, botanist, older people in community, any informed person, and students relating what their parents or relatives have told them about the medicinal value of plants.

3. A visit to the library and research in its folklore section.

4. Vertical file in the library could be of use.

5. A study of earlier people's existence could prove interesting.

6. A guided visit to a wooded area with various plants.

7. Interviews with rural people in the community.

8. After learning about the prior medicinal value of plants, students will be asked to collect available samples and mount on paper and a short description of its medicinal use. Some plants may not be available because of locale.

9. These samples could be put into a form of booklet and distributed in the school free or for a small fee.

10. Relate this type of organized writing to the recent Foxfire publication.

CEMETERY

Overview: Students will learn about the past and how people and life have changed from time to time through exploring a cemetery.

Materials and Equipment: Paper and pencil

Activities: Take the class to an old (family) cemetery and have the students record on paper the names, births, deaths, ages and any unusual sayings or markings that may appear on the grave markers. If possible have them construct a family tree. Then discuss what you found in the cemetery.

Example Questions:

	Full Name	Birth	Death	Age
1.				
2.				
3.				

1. In what age category did the people live?

0-10	____	51-60	____
11-20	____	61-70	____
21-30	____	71-80	____
31-40	____	81-90	____
41-50	____	91-100	____

In which category did most people die? _____

Why do you think they died at that particular age?

2. Who was the first person buried in each of the families represented?

3. Who is the youngest and oldest buried here?

4. Was the life span higher for men or women?

5. Are there any indications of epidemics?

6. What was the mortality rate of infants and why?

7. Of what type stone are the grave markers made?

8. Are there any unusual epitaphs?

ACRES, SECTIONS AND TOWNSHIPS

Overview: Students will become acquainted with the size of an acre. This will help them understand sections and townships.

Materials and Equipment: Paper, pencils, measuring tape

Activities: Take the students outside to an area that is large enough to mark off an acre. (209 feet by 209 feet) Ask for volunteers to estimate the size of an acre. Have the volunteers place fellow students at each corner of the estimated acre. After several estimates, have the class see who is most nearly correct.

Once the size of an acre has been estimated and discussed, ask how the students may mark off a more accurate acre. This will involve first finding the real size of an acre through mathematics, so allow the students to suggest ways of determining its size. This will then be a good time to inter-relate the various units of measure.

Example Questions:

1. How many acres make one square mile?
2. How many sections in a township?
3. How many square miles in a township?

4. How many acres in a section?

5. How many acres in one township?

Return to the classroom and briefly discuss the various Land Laws and their effect on the people of Alabama. With knowledge gained from the outdoor activity, the student should be in a more receptive mood and capable of more fully understanding the lesson.

AMERICA'S ORIGINAL INHABITANTS

Overview: Students will be subjected to thinking about the life of Indians and the problems they faced when white man entered their domain.

Materials and Equipment: Paper and pencil

Activities: Take the students to a rather secluded spot in the woods, if possible out of hearing of other students and the noise of automobiles. Start the activity by asking the students to listen to the natural sounds and try to put themselves in the minds of men who controlled all of what is now the United States. Remind them that the land is primarily unchanged from the natural state of affairs; only minimal farming and hunting is taking place. Have some student lead a discussion on what life is like in this pre-White Man territory. Suggest ideas that may be discussed by asking questions.

Example Questions:

1. Who would be your leader?
2. What role would you play?
3. How important would you be to your tribe?
4. What kind of clothing would you be wearing? Why?
5. What could you do with your spare time?
6. How would you travel to visit friends in other areas?
7. How would you feel if someone came in and took all this away from you?
8. What would you do to prevent the loss of your land?
9. How much would you be willing to give up without protest of some sort?

10. Would it be right or wrong for you to want to keep your land? Why?
11. Would you be satisfied to give up your land after being defeated by outsiders?
12. How do you think your children would feel about having lost land? Grandchildren? All of your descendants? Would their feelings be right or wrong?
13. How do Indians feel about White Man today? Are their feelings justified?

MAPPING ALABAMA

Overview: Students will become acquainted with the locations of the major roads, streams and cities in Alabama. They will also be able to locate the various geographical areas and the state's natural resources.

Materials and Equipment: A shovel, sand, white string, Blue string, a tape measure, and a package of colored construction paper.

Activities: Divide the class into groups to work in the following areas: roads, streams and lakes, cities, geographical areas and natural resources. The groups will work independently but as a class to construct a raised relief map of the State of Alabama. Select a flat area free of vegetation.

Assignments:

1. The geographical areas group will scratch the surface of the ground with a shovel to make an outline of the state using a scale of five feet to represent 100 miles. The group will also be responsible for constructing the mountainous areas of the state with sandpiles.

2. The streams and lakes group will use the blue string and blue construction paper to illustrate where the major streams and lakes are located. Write the names of streams on the construction paper and place them on the map.

3. The roads group will use the white string to depict the major highways in the state. Write names of the major highways on the yellow construction paper and place them on the map.

4. The natural resource group is responsible for locating the natural resources of the state and marking the areas on the map with green construction paper that depicts the resource.

5. The major cities group will use the red construction paper to depict the cities. The name of the city should be written on it.

GEOGRAPHICAL TERMS

Overview: Students will locate geographical terms on the map that they constructed in the previous lesson plan entitled, "Mapping Alabama."

Materials and Equipment: Paper and pencils

Activities: Take the class to the map of Alabama that was constructed on the school campus. Ask the students to study the map very carefully and write a sentence depicting the location of the following geographical terms. Ask them to also write a definition of each term.

Examples:

island	mountain	marsh
bay	river	black belt
delta	stream	fall line
inlet	lake	coastal plain
peninsula	gulf	plateau
tributary	canyon	basin
valley		

ALABAMA'S POPULATION AREAS

Overview: Students will determine why certain areas of Alabama are more populated than others. To do this the students will use the map that they constructed in the lesson plan entitled, "Mapping Alabama."

Background: The students should know the major population areas of Alabama.

Materials and Equipment: Paper and pencils

Activities: Take the class to the map of Alabama that was constructed on the school campus. Ask the students to locate the major population areas of the state. Then have them pick three populated areas and one unpopulated area. They are to write a paragraph about each of these areas telling why they are populated or unpopulated.

Helpful Hints: To answer the questions above the students should study the geographic locations of the populated and unpopulated areas, the type of transportation in the area and the natural resources which includes minerals, amount of water, land topography, type of soil, climate, etc.

ENVIRONMENTAL EFFECTS OF TVA

Overview: Students will be able to explain the environmental effects that TVA has had on this geographical area and how they are personally effected.

Materials and Equipment: Paper and pencils

Activities: Before taking the class to Wilson Dam, have the class prepare a list of questions. If possible, give a copy of the questions to the TVA tour director several days in advance.

Example Questions:

1. What erosion problems arose due to seasonal flooding before the construction of Wilson Dam?
2. What is the average level of the lake and how much area was submerged by building the dam?
3. What problems now occur because of water fluctuations?
4. Compare the number of homes in this area that had electricity in 1935 and in 1945. What does the result show?
5. What are three methods of producing electricity used by TVA?
6. How much electricity is annually produced by TVA?
7. What were the natural characteristics of the Tennessee River which prohibited river transportation?
8. What are the advantages of the area now to industry because of TVA?

9. What are the arguments concerning the public or private ownership of TVA?

While on the same trip you may want to visit the Fertilizer and Phosphate Development Works.

Example Questions:

1. What problems existed here that promoted the construction of a fertilizer plant by the government?

2. How is fertilizer made?

3. How does the production of fertilizer help TVA keep the cost of power down?

4. Why is the government interested in making fertilizer?

5. Does just this part of the United States benefit from the fertilizer plant?

As a follow-up assignment have the class write a theme using one of the following titles:

1. TVA, "How it Affects Me"

2. Private or Public Ownership?

3. TVA, "Has it Changed Our Area?"

GEOGRAPHIC TERMS

Overview: Students will be involved in locating examples of geographic terms in reality, in miniature or in make believe. If these terms cannot be found, the students are to explain why they are unable to do so because of location, climate, season, land-formation, etc.

Materials and Equipment: Paper and pencil

Activities: Take the students outside and have them follow the direction on the worksheet.

STUDENT WORKSHEET

From the following list of geographical terms, first match the definition to the word by writing the correct letter by its number. Then be able to point out to us an example of that term in reality, in miniature or in make believe. If it is impossible to show an example or a substitution of your term, explain why you are unable to do so (because of location, climate, season, land-formation, etc.):

____1. altitude	____6. desert	____11. isthmus	____16. strait
____2. bay	____7. equator	____12. jungle	____17. tributary
____3. canyon	____8. glacier	____13. marsh	____18. tropics
____4. current	____9. highland	____14. peninsula	____19. tundra
____5. delta	____10. inlet	____15. plateau	____20. valley

A. A region of low, wet land which is usually treeless.

B. A body of land almost surrounded by water.

C. Part of a body of water that reaches into the land.

D. A large body of slow-moving ice.

E. A norrow strip of water extending inland.

F. An imaginary line around the earth which is the same distance from the North and South Poles.

G. Low land between hills or mountains.

H. The height above sea level.

I. A region which is mostly flat, high land.

J. A thick, tangled growth of trees and other plants.

K. A land too dry or too cold to grow many plants.

L. A cold, treeless plain in the Artic region.

M. A narrow strip of land that connects two larger bodies of land.

N. The land deposited at the mouth of a river.

O. A warm region on either side of the equator.

P. High or mountainous land.

Q. The steady flow of water in one direction.

R. A river or creek that flows into a large river.

S. A deep, narrow valley with steep sides.

T. A narrow channel of water connecting two larger bodies of water.

MILL

Overview: Students will obtain first-hand knowledge of how a dam and mill was built in the 1930's, its function then and its use today.

Materials and Equipment: Paper and pencil

Background:

Andy Jordan, a prosperous landowner and entrepreneur in Franklin County, told friends when he built his mills and dam on Little Bear Creek during the 1930's that they would stand as his monument.

Even though he died about four years after the two-year project was completed, the dam and part of the original grist mill still stand and are being used by W. A. Barksdale, Rt., 2, Vina.

The mill, powered by a water-driven turbine, is used only as a grist mill to grind cornmeal and flour now, but it was originally an expansive operation, consisting of a saw mill, grist mill and cotton gin.

Barksdale, 72, the fourth owner of the mill and operator for the past 19 years, said the three-stone grist mill will "turn" an average of 400 pounds of meal per hour. Even though cornmeal and flour are the main products produced by the three-man operation, other grains, such a rye and soybeans, are also ground to be used in livestock feed, he said.

Bran from corn and wheat ground in the mill is collected for use in livestock feed also, he said.

The original milling complex would produce 15,000 feet of lumber and gin 16 bales of cotton a day, Barksdale said.

Jordan spent about $11,500 for construction of the dam and mills, Barksdale said. Barksdale recalls that he had received 50 cents a day for mixing cement in a wagon bed to build the dam. Jordan paid carpenters $1.25 per day in the project, he said.

"Food prices have risen considerably since Hoover days, but that hasn't affected my charge for grinding,"

he said, "I still charge one-eighth of a turn or $1 per bushel."

"I can produce plain or self-rising cornmeal or flour," he said.

People have come from as far away as Memphis and Birmingham to have grain ground at his mill, he said.

Activities: Take the class to the Andy Jordan Milldam on Little Bear Creek near Alabama Highway 24 East of Red Bay. The mill operates six days a week, but only two days, Wednesday and Saturday, are for the public.

Questions:

1. What is a grist mill?
2. What types of grain are ground in a grist mill?
3. What is the difference between plain and self-rising cornmeal and flour?
4. How does a waterwheel work?
5. How do we use water power today?
6. Why is grain ground for animals?

U.S. POST OFFICE

Overview: Students will become acquainted with the history of the Post Office and how it functions.

Materials and Equipment: Paper and pencils

Activities: Before taking the class to the Post Office, have the class prepare a list of questions. If possible, give a copy of the questions to the manager of the Post Office several days in advance.

Example Questions:

1. When did the U.S. start the postal system?
2. How is the Post Office governed?
3. What are the jobs of the employees?
4. What happens to a letter when mailed?
5. What services do a Post Office render?
6. How does mail travel?

SOCIAL SECURITY OFFICE

Overview: Students will understand how Social Security works as to its functions and benefits.

Materials and Equipment: Paper and pencils

Activities: Before taking the class to the Social Security Office, have the class prepare a list of questions. If possible, give a copy of the questions to the manager of the office several days in advance.

Example Questions:

1. Why is the percentage of people age 65 or older increasing?
2. What benefits are provided under the old age and survivors insurance program?
3. How is the program financed?
4. How was it originally financed?
5. What old age assistance is provided people not covered by Social Security?
6. What is Medicare?
7. Who is eligible for the different programs under Social Security?

ELECTRICITY

Overview: Students will become acquainted with the different methods of producing electricity in our area.

Materials and Equipment: Paper and pencils

Activities: Take the class to the places listed below to study the different methods of producing electricity. After the trips, discuss the information that they obtained.

Example Questions:

1. What is the most economical method of producing electricity?
2. What types of environmental pollution are caused by the various methods of producing electricity?
3. Have the students list the major industrial users of electricity.
4. Compare the amount of industrial electricity with that used by the local community.
5. During which seasons of the year is the most electricity used? The least used?
6. During what part of the day does the greatest use of electricity occur?
7. What are other methods of producing electricity?
8. What can individuals do to conserve electricity?

PUBLIC UTILITIES

Overview: Students will understand how our public utilities are distributed and controlled by the proper agencies and boards. Students will also realize that there is a need to conserve public utilities.

Materials and Equipment: Paper and pencils

Activities: Before taking the class to the public utilities office, have the class prepare a list of questions. If possible, give a copy of the questions to the manager of the utilities several days in advance.

Example Questions:

1. How much do public utilities cost the local government?
2. What percent of the local budget goes into the administration of our public utilities?
3. How much deposit must be put up by the consumer to have public utilities installed?
4. What is the purpose of the deposit?
5. How are public utilities rates determined?
6. How well does the system of public utilities serve the local community?
7. What new government regulations do you have concerning the energy crisis?
8. What can we do to conserve the public utilities?
9. Who governs the public utilities?

MAKING WOOD SHINGLES

Overview: To demonstrate why the pioneer had to spend most of his time working and why his house was usually a small cabin. This can be done in any area outside the school building. Multiplication and devision skills are stressed.

Materials and Equipment: Ax, fro, mallet, watch, paper, pencils and a block of wood (white oak, free of knots and 18 inches long with a 12-inch diameter)

Activities: Take ax and split block of wood. Use fro to make shingles. Keep record of time it takes to make one shingle. Find the average time it takes to split one shingle.

Example Questions:

1. How long does it take to make one shingle?
2. How long would it take to make 2000 shingles?
3. What kind of wood or trees were used for making shingles?
4. What instrument is used for making the shingle?
5. What materials are used for making a roof today?
6. What material did the pioneer have to buy to make a roof? (To fasten the shingles)
7. How long did a split-shingle roof last? (Inquire in neighborhood)
8. Which type of roof would you prefer and why?

ART USING LEAVES

Overview: Seven art activities are described that will help students realize the importance of leaves to human life. Students will become more observant and appreciative of their environment and the students will become more aware of the beauty of nature around them by observing leaves.

Materials and Equipment: These are mentioned with each activity.

Activities: Walk around among and near the trees on the campus just looking at the different leaves. Tell the students to gather seven leaves on their trip. Make a point to sit down in the sun after the walk. (This will teach the students to appreciate leaves for making a shade)

Example Questions:

1. How important are leaves to you?
2. If "shade" is guessed, then get up and move directly to the shade to sit.
3. What kind of leaves do you know?
4. How do the leaves look to you?
5. Why do they change color?
6. What colors do they change?
7. What time of year do they change?

8. Do they stay this color all year?

9. What would the world be like without beautiful colors?

10. What would the world be like without leaves?

11. Do leaves absorb carbon dioxide?

12. How do leaves help forest animals?

13. How do leaves help people?

14. How do dead leaves on the ground help plants?

15. What would happen if all the leaves were alike or all the same kind?

16. What makes some leaves prettier than others?

17. What makes some leaves stay green all year?

18. What happens to the leaves left on the ground?

19. How are leaves alike?

20 Name the parts of a leaf.

21. Compare the sizes of the leaves.

22. Compare the shapes of the leaves.

23. Compare the texture of the leaves.

Activities:

1. Drop a drop of water on a leaf and see how the drop clings to the leaf.

2. Drop some water on some leaves and see how leaves cushion the force of raindrops.

3. Leaf Prints - Have your students place a leaf on

a hard, flat surface, vein side up under a white piece of paper and rub with a crayon. A leaf impression will be made.

4. Place Mats - Have your students tear off two pieces of wax paper for each student. Place one piece of wax paper on a hard surface. Place the leaves on the paper. Cover the leaves with the second sheet of wax paper. Run a warm iron over the wax paper. This will seal the paper and preserve the color of the leaves.

5. Collage - Have your students make a leaf collage. Give each student a small sheet (perhaps 1/4 sheet) of construction paper. Tell them to paste the leaf they have on the paper, then draw a head, arms, legs, and so on, on the paper to make leaf people or animals.

6. Spatter prints - Have your students make spatter prints. A bottle of ink, or tempera paint, an old toothbrush, a piece of wire screen and sheets of white paper are used. Place a fresh leaf on the paper and pin it down flat. Dip the toothbrush in the ink or paint, letting the excess drain off. Hold the wire screen over the paper and rub the bristles over it, working from side to side and from top to bottom. Draw the bristles toward you so the ink will spatter sway from you. When the ink or paint is dry remove the leaf. The imprint will remain.

7. Blue Prints - Use blueprint paper, a piece of window glass, and a pan filled with clear water. You will need to stay in out of the sun for the first part of this. Lay the leaf on the treated side of the blueprint paper and cover with the window glass. Expose it to sunlight until the paper turns dark blue. Remove the glass and leaf and quickly wash the paper in the pan of water until the color "sets." Dry the paper on a smooth, flat surface so it will not curl. The impression of the leaf will be white or pale blue on a darker blue background.

USING TEXTURE

Overview: The student will learn to use objects in nature to show texture as a quality that identifies its individuality.

Materials and Equipment: Paper and pencils

Activities: Show examples of visual and tactile texture combined to form a "collage".

Discuss with the students the difference in the two types of textures. Ask which process, visual or tactile, would be more of a contribution of the designer.

Point out (with students contributions) the many different textures found in nature. After the discussion ask the students to go out and bring in as many different textures as possible.

When the students return, ask each student to tell why the texture is interesting and whether it is visual or tactile.

LINES

Overview: Students will learn to recognize a line as a unifying force that makes a total composition a good design.

Materials and Equipment: Paper and pencil

Activities: Take the students outside and introduce horizontal, vertical diagonal, intersecting and radial lines by showing them examples in nature: trees, mountains, lakes, fallen objects, rocks, etc.

By using illustrations, identify each of the above lines. Discuss how line assumes meaning through association with the environment:

Examples:

1. A lake or far horizon assume the restful expression of horizontal line.

2. Trees, buildings, posts, mountains assume an aspiring position, reaching up as exemplified in the vertical line.

3. Diagonal lines remind us of the lightning or falling objects and show restlessness in nature.

Show how lines mentioned above can oppose, intersect, or lean to form more complicated patterns.

MOBILES

Overview: Students will learn how to use natural materials to make a mobile. It will also motivate students to observe and space nature's objects into a creative unit, through a feeling of rhythm, movement, balance, texture, and variety.

Materials and Equipment: String and glue

Activities: Discuss the meaning of mobiles and scan the techniques used in constructing the object. Talk about what materials can be utilized. Go on a collecting trip outdoors. Select a stick from which the objects can suspend. Begin at the lower section of the mobile. Choose two objects and hang the objects at opposite ends of the stick. Determine the balance point of the unit. Tie a thread or add glue to secure the materials.

Work upwards, creating the next level of the mobile, until the desired feeling is obtained. Have the students discuss the materials they used and why they used them in certain areas. Talk about the characteristics of balance, unity and texture used in their creation. Pick a favorite limb and hang for display.

Example Questions:

1. What is a mobile?

2. What are characteristics of all mobiles?

3. What is balance?

4. What is rhythm?

5. What is unity?

6. What is texture?

7. For what kinds of materials whould we look?

8. Tell me about your creation.

CRITTERS

Overview: Using their imagination students will make animals out of natural material that they find.

Materials and Equipment: Glue

Activities: Take the class outside to look for natural materials that can be used to make an animal or critter. For example - tree bark, twigs, leaves, moss, lichens, pine cones, nuts, grass, rocks, seeds, etc.

Display the critters and ask each student to tell or write a story about his critter.

In a discussion about the critters you may want to talk about the materials used.

Example Questions:

1. What materials did you use?
2. How old are the materials?
3. What is their function in nature?
4. In what type of habitat did you find the material?
5. Do any animals eat these materials?
6. What animals use the materials for a home or shelter?

NATURAL DYES

Overview: The students will become acquainted with how natural dyes were made from plants by Indians and early settlers.

Materials and Equipment: Hot plate or campfire, pans, water, string, pieces of cloth, and natural material from which to make dyes such as berries, bark, flowers, leaves and roots of a wide variety of plants.

Activities: Take the students outside to gather natural materials for dying. Boil the materials in a pan of water until the water turns real dark in the color you desire. Then pour the liquid through a strainer to obtain a clear dye. Place cloth in the pan of dye until it is saturated, then hang it up to dry.

To obtain patterns, tie dying is fun. Wrap string very tightly around the cloth in various places to obtain the desired patterns.

As a culminating activity you may want to have a discussion.

Example Questions:

1. Would the location of the settlement or Indian tribe have any affect on the colors used by the people living there?

2. What kinds of plants did you use?

3. What colors when mixed make other standard colors?

4. What colors did you find to be the most prevalent?

5. What is the greatest problem in using this type of dye?

6. Would climate have an effect on the colors used?

STIPPLE DRAWING

Overview: The students will learn how to draw using the stipple method - an execution in graphic art by which gradation of light and shade is produced by separate touches to make light and bold dots.

Materials and Equipment: Paper and pencils

Activities: Take the students to an area where they can gather an object in nature such as a flower. Using a pencil, and placing the flower on a piece of paper, dot around the outside (contour) with the pencil. Then carefully finish filling in the picture with dots of different weight.

SHAPES, LINES AND COLOR

Overview: Students will discover elements of design in shapes, lines and color in their environment.

Materials and Equipment: Paper and pencils

Activities: Take the students on a walk to survey the aesthetic qualities of their environment. You should ask thought-provoking questions so that discussion will occur spontaneously.

Example Questions:

1. What elements compose art?
2. What are elements in creativeness?
3. What kinds of elements do you see in this surrounding?
4. What is shape?
5. What is a limiting factor of shape?
6. What different shapes do you see?
7. What different colors do you see?
8. What lines do you see?
9. Describe the lines you see. Are they fat, thin, delicate, bold, faint or strong?
10. What in terms of art is nature?

COLLAGE

Overview: Students will learn how to use natural materials to create a design or picture.

Materials and Equipment: Glue and cardboard

Activities: Discuss with the students the technique of collage creativeness. Talk about the possibilities of materials that can be found on their school campus.

Take the students outdoors and survey the area for natural materials. Look for objects that stress a variety of line, form, texture and color. Gather the materials and arrange them creatively on a piece of cardboard. Then have the students discuss the designs they have formed.

Example Questions:

1. What is abstraction?
2. What is design?
3. What makes up design?
4. What is the difference between a collage and a mosiac?
5. What is texture?
6. What kinds of texture can one find?
7. What types of materials were used?
8. Tell about your creation.
9. How many kinds of shapes are used?

10. How many colors are used?

11. What different types of textures are used?

12. What shows line?

CLASSIFICATION OF LAND

Overview: The purpose of this field trip is to bring about an understanding of the eight classes of land.

Materials and Equipment: Paper and pencil

Activities: After covering the eight classes of land, take the students outside to locate the different classes of land in your area. Have each student write a descriptive paragraph about each class of land visited. If the land can be put to better use, have them describe how and why in their paragraph.

Questions:

1. Is all land suitable for cultivation?
2. Why are all lands not suitable for cultivation?
3. Steep hillside land is used for what?

Helpful Hints: The United States Department of Agriculture has completed a classification of land to determine which is suitable for agriculture and the care that should be given it. On a field trip around your area try to find the eight classes of land and give their possible uses. The capability classes are:

Class I -Can be cultivated safely without special care.

Class II -Needs only easily applied conservation treatment.

Class III -Requires special conservation practices when cultivated. Sloping land.

Class IV -Not for regular cultivation: requires careful management when plowed, usually steep sloping.

Class V -May be stony or wet but is not liable to erosion; for pasture and woodlands. Land unsuitable for cultivation.

Class VI -For pasture, woodland, recreation, water supply and wildlife. Hillside.

Class VII -May be used as Class VI but requires very careful management.

Class VIII-Requires special protection: suitable only for recreation, wildlife, and water supply. Mountain area.

SOIL

Overview: Students will observe several samples of soil and discuss its contents.

Materials and Equipment: Spoons or small digging devices, small containers for soil samples, paper and pencils

Activities: Divide the students into groups of four. Give each group a spoon or digging device and send each group to different areas of the campus to obtain a sample of soil and any growth in or on it.

After each group has obtained their soil sample and written a paragraph describing their sample. Call the groups toegther to share their findings. Then lead the class in a discussion using questions listed below:

Example Questions:

1. Did you find all soil samples alike?
2. How were they different?
3. Are soils of different colors?
4. Are pieces of rock in your samples? If so how did they get there?
5. How do you think the soil was formed?
6. Did you find plants?
7. Why do you think plants chose that particular place to live?

SOIL CONSERVATION

Overview: Students will investigate eroded places and determine the cause and effects.

Materials and Equipment: Pencil and student worksheet

Activities: Take the students on a field trip around a designated area, and complete the worksheet.

Example Questions:

1. On which type of soil is runoff the most effective agent of erosion?
2. What types of vegetation could you plant in your area to prevent or decrease erosion by runoff?
3. Does the runoff of your area carry away good soil or does it deposit fine particles and build up land?
4. Can you classify your area as to the type of runoff commonly occurring? Why?
5. Can you determine whether runoff is causing rapid or gradual erosion? Why?

Helpful Hints: The surface of the earth is worn down gradually by a process called erosion. Erosion is the picking up and carrying away of the earth's materials. Water flowing across the earth's surface erodes more than any other agent.

Runoff includes permanent streams as well as the sheets of water which flows across the land after a rain or when snow and ice melt. Several factors affect the amount of runoff in any area.

STUDENT WORKSHEET

Working alone, check the phrase or phrases which best describe the area.

1. Kinds of Precipitation (one or more)
   ____Sudden violent storms and arid periods
   ____Gentle rain of long duration
   ____Slowly melting snow
   ____Quickly melting snow

2. Gradient or Slope
   ____Level land
   ____Slight slope
   ____Gentle hills
   ____Steep grades

3. Soil Type
   ____Clay soil
   ____Fine sandy soil
   ____Coarse sandy soil
   ____Loose mixed sand and rocks
   ____Bare rocky outcrops

4. Vegetation
   ____Grassy plains
   ____Plowed land with no vegetation
   ____Grassy meadows with few trees
   ____Trees with no underbrush
   ____Semi-arid grass and bushes
   ____Arid land with desert shrubs

5. Temperature and Evaporation
   ____Warm - rapid evaporation
   ____Cold - swift runoff and little evaporation
   ____Moderate - normal runoff and moderate evaporation

6. Type of Streams
   ____Permanent rivers confined to normal channels
   ____Intermittent streams with rapid runoff when flowing
   ____Permanent rivers which often overflow their banks during heavy rains

SOIL INVESTIGATION BY MAKING A SOIL PROFILE

Overview: Students will learn how to make a soil profile and describe what they find.

Materials and Equipment: Pencil, paper, shovel or spade, yardstick, Ph testing kit and student worksheet

Activities: Have the students pick up a handful of soil and feel of it, smell it, and look closely at the soil. After they examine the soil for a few minutes, have the students write a short paragraph on "What Soil Means to Me". After the students have completed their paragraphs discuss their thoughts. After this complete the work sheet.

Example Questions:

1. What is soil?
2. Where is soil found?
3. What is the difference between soil and dirt?
4. Soil is made of what materials?
5. How deep is soil?

Helpful Hints: Making a vertical cut in the earth's surface will show the horizontal layers of soil. This cut is called a soil profile.

The soil in an area can be investigated by taking a soil

profile. Three different parts to a soil profile are often observed. The upper region is called the topsoil, or the A horizon. The topsoil includes the soil region washed downward by rainwater. The upper part of the topsoil contains large amounts of decayed plant and leaf material in areas where plants grow abundantly, such as in forests. In such cases the topsoil is usually darker than the region below.

The region below the topsoil is called the subsoil, or the B horizon.

The C horizon is the region just above the bedrock. This region is usually composed of weathered bedrock material. In parts of the northern United States, the C horizon is often composed of slightly weathered rock material which was transported southward by the glaciers some time during the ice age.

As the A horizon erodes away, the B horizon gradually changes into the A horizon, and the C horizon changes into the B horizon. As bedrock breaks down, more C horizon material forms.

STUDENT WORKSHEET

Take a soil profile of the soil on top of a hill, on the side of a hill, and in a valley.

1. Draw the soil profile of each area.

2. What kind of soil texture did each profile have? (sand, silt or clay)

3. What is the color of each horizon?

4. What is the depth of each horizon?

5. Describe the type of rock in the bed rock. (if present)

6. What is the depth of the soil in each profile?

7. What is the average depth of the topsoil?

8. What is the average depth of the subsoil?

9. What is the topsoil's Ph?

EARTH'S CRUST

Overview: Students will be introduced to a variety of materials found in the earth's crust and to help them see that they are capable of finding interesting facts within their everyday surroundings.

Materials and Equipment: Pencils and student worksheet

Activities: Take the class on a walk around the school grounds and have them do the worksheet.

Helpful Hints: The trip may be as simple as a walk around the school grounds, but it will be more meaningful if you can find road cuts and excavations. You also may have students walk around a park or vacant lot, past public buildings made of stone, and along a river bank as a way to have them become acquainted with some of the various earth materials that they will be studying. Comments and questions about land surfaces should be invited, especially if there is any relief that can be observed. If you can make the trip immediately following a rainstorm, have the students make sketches of the rivulet patterns. Invite speculation about cloud formations and their meanings.

Before the trip, it might be useful to discuss some of

the student worksheet questions in class. However, leave the final answers for students to discover during the field trip. Students also may suggest questions of their own to answer on the field trip.

STUDENT WORKSHEET

1. What is the composition of soil?
2. How is soil made?
3. What is found under the soil?
4. How thick is soil?
5. Why does wind carry dust sometimes, but not always?
6. From where does dust carried by wind some?
7. What becomes of the dust carried by wind?
8. What becomes of the water that falls during a rainstorm?
9. What kinds of material are buildings made of when they are not made of wood?
10. How do you describe your immediate area? Do you live on a plain, in a valley, or on a mountain?
11. Are any hard rocks exposed in your area? If not, what is present on the surface?
12. What kind of climate does our area have?
13. What changes can you observe in your environment on a daily basis?

BUILDING A SUCCESSION PLOT

Overview: Students will become involved in the development of a succession plot. The results of this study will take years to develop, but the results will be worth the time.

Materials and Equipment: Paper, pencil, lawn mower and four wooden stakes.

Activities: Stake off an area that is approximately fifty feet square. Cut the entire area with the lawn mower. Make an inventory of the plants found in the plot. For an entire year cut all of the plot except for one row that is the two widths of the mower. The next year cut all but the first and second row. The next year cut all but the first, second and third row. Continue to cut in this manner year after year. A stair stepping effect in vegetation will begin to develop with each year.

Make an inventory each year of the new plants found in each row. The succession plot developed will probably depict something similar to the following:

grasses, low flowering plants, shrubs, small trees, larger trees

SUCCESSION

Overview: Students will become familiar with plant succession on bare rocks.

Materials and Equipment: Paper and pencil

Activities: Take the class to a rock where lichens are present. Ask the students to describe what the lichen is doing on the rock.

Helpful Hints:

Lichens are called pioneer plants. While growing on rocks they secrete an acid that slowly dissolves the rock. They also swell and shrink during periods of moisture and drought; as a result they rub away small particles of rock to form soil.

Look for moss and ask the students to describe what moss is doing to the rock.

Helpful Hints:

Mosses often precede larger plants into rocky areas. This is so because mosses are important in the formation of soil which larger plants require. The rhizoids of mosses secrete chemicals which break down rocks into tiny soil particles. Because mosses carry on photosynthesis more effectively than lichens, the mosses eventually overgrow most of the lichens. Consequently, a moss community succeeds a lichen community.

Now that the class has discussed the probably first two stages of succession that takes place on a bare rock, have them look for the next stage of succession.

Helpful Hints:

In the steadily accumulating soil among the mosses, seeds of grass, shrubs, or trees are able to germinate. These larger plants do not necessarily displace the mosses, but as they grow upward, they hide the mosses from view. Being larger, they contribute more to the developing soil. These plants have roots that push down into cracks in the rock, forming even deeper pockets of soil on the rock's surface.

As a culminating activity, ask the students to draw a sequence picture which depicts the different succession stages that can take place on a bare rock.

LICHENS

Overview: Students will observe different kinds of lichens, their reproduction and their effect upon the surface on which they live.

Materials and Equipment: Paper, pencil and hand lenses

Activities: Take the class to an area where lichens grow. Have them locate as many different kinds of lichen as they can and describe their habitats. Discuss with the class how they reproduce and the part lichens play in plant succession.

Questions:

1. What are lichens?
2. What part does the fungus play?
3. What part does the alga play?
4. Where do they usually live?
5. How do they help make soil?
6. How do they reproduce?

Helpful Hints:

A lichen is a combination of an alga and a fungus that live together in a symbiotic relationship. The alga produces the food and the fungus absorbs and stores water.

There are more than 15,000 kinds of lichens. They usually

live on bare rocks and trees or tree stumps. They do not require soil for growth. They usually help make soil. This is done by producing acids that break down rocks upon which they live. The small particles of rocks plus decayed lichens form soil.

Lichens do not have roots, stems or leaves. They are layers of irregular shaped extensions called thalli.

Lichens reproduce by fragments that break off and are carried by the wind. When they drop to the ground and the growing conditions are favorable a new lichen plant will grow.

Many lichens contain starch and serve as valuable food for man and animals. Certain lichens are used to make commercial litmus.

MOSS

Overview: Students will become acquainted with moss and study their life cycle.

Materials and Equipment: Paper, pencil and hand lens.

Activities: Take the class to an area where moss grows. Have them describe the different parts of moss and the type of environment in which it is growing. Look for several varieties and the different stages of reproduction.

Questions:

1. To what phylum does moss belong?
2. Does moss have leaves, stems, flowers and true roots?
3. Where does moss grow?
4. How does moss reproduce?
5. Male and female cells are formed in what organs?
6. What are protonema?

Helpful Hints: Moss, phylum Bryophyta, is a green plant that grows close together in bunches that often form pads. A single moss plant has tiny leaves growing around the stem. The rootlets, called rhizoids, look like hairs and grow from the bottom of the stem. Moss is usually found on damp banks, rocks and trees.

Mosses reproduce in two stages. The first occurs when male and female plant cells join to form a new growth. Male and female cells are formed in different organs that grow on top of the moss stem. The male and female organs are called antheridium and archeganium. The antheridium burst when it becomes ripe and damp enough for the male cells to escape. The moisture helps carry the cells to the archegonium, where they travel through a tube and join the egg. The two cells then grow together and form a long, erect stalk called the seta with a spore case or capsule on top.

The asexual stage in the growth of the new plant takes place in the capsule where the spores are located. The spores can be scattered either by water or by wind. The spores may sprout into branching threadlike growths called protonema. Buds from the protonema then grow into new moss plants.

FUNGI

Overview: Students will observe different kinds of fungi, their reproduction and the effect they have upon the surface on which they live.

Materials and Equipment: Paper, pencil and hand lenses

Activities: Take the class to an area where the students can observe several fungi growing. Have them locate as many different kinds of fungi as they can and describe their habitat. Discuss with the class how they reproduce and the part they play in plant succession.

Questions:

1. To what phylum do fungi belong?
2. Where can fungi be found?
3. Do fungi have leaves, stems or flowers?
4. How do fungi reproduce?
5. Do fungi have any chlorophyll?
6. Do fungi live on dead and living material or both?
7. What do you call something that lives on dead material?
8. What do you call something that lives on living material?
9. How does fungi help man?
10. What does fungi do for a forest?

Helpful Hints:

Fungi belong to the thallophytes which make up the lowest division in the plant kingdom. They are simple plants without stems, leaves or flowers and they occur everywhere in water, air and soil.

Fungi reproduce by spores from the union of gametes (sex cells). Others reproduce asexually (without the union of sex cells) and some can reproduce by both methods. The wind usually scatters the spores.

Fungi do not have chlorophyll to manufacture their food. They must live on dead matter (called saprophytes) or on living matter (called parasites). They obtain their food by simply absorbing the minerals, sugar and water from material on which they grow. However, the fungi usually secretes enzymes into the matter to make it soluable so they can absorb it.

Fungi can be eaten by man and other animals. They are also used in medicine. Saprophytic fungi causes decay and decomposition of plant and animal matter.

MUSHROOM

Overview: Students will become familiar with the different parts of a mushroom and its habitat.

Materials and Equipment: Paper, pencils, hand lenses, and a small shovel

Activities: Take the students outside to look for mushrooms. Have the students very carefully dig around a mushroom and remove it from the ground, leaving a clod of dirt. With a hand lens have them look for the mycelium in the clod. Each student should examine a mushroom very carefully, draw a picture with the parts labeled and describe the habitat in which they found the mushroom growing.

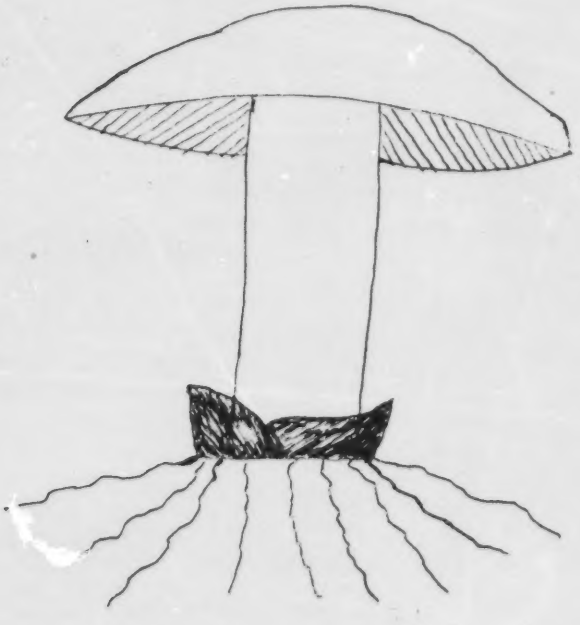
Questions:

1. To what phylum do mushrocms belong?
2. Where do they grow?
3. On what type of matter do they grow?
4. What colors are mushrooms?
5. How do they reproduce?
6. The main part of a mushroom grows above or below the ground?
7. What are the parts of a mushroom called?

Helpful Hints:

Mushrooms are fungi which belong to the thallophytes. These are about 38,000 known species. Mushrooms grow in decaying vegetable matter, sometimes hidden under leaves or moss. They have different shapes: umbrella, coral, and shelf. Their colors range from pure white to pastel pinks and lavenders, from pale yellow to flaming orange and brilliant red, from dull gray to velvety brown.

The main part of a mushroom is under ground, called the mycelium. The umbrella is called a sporophore. The underside of the umbrella contains the gills, which bear the spores. The spores are scattered by the wind.



FERNS

Overview: Students will become acquainted with ferns and study their life cycle.

Materials and Equipment: Take the class to an area where ferns grow. Have them describe the parts of a fern and the type of environment in which it is growing. Look for several varieties and different stages of reproduction.

Questions:

1. To what phylum do ferns belong?
2. Do ferns have flowers?
3. How do they reproduce?
4. The male cell comes from what organ?
5. The female cell comes from what organ?
6. Ferns flourished during what geological age?

Helpful Hints:

Ferns, phylum Tracheophyta, are flowerless plants that are usually found in moist, shady woods among rocks. The leaves are called fronds. The ferns reproduce by means of spores and sex cells. The spores grow on the backs of the leaves. When the spores ripen the cases burst open and the spores fall to the ground. Each spore then develops into a tiny green plant that is shaped like a heart. This tiny

plant develops special tissues which produce male and female sex cells. The male cell comes from an organ called the antheridium, which is comparable to the anther in flowers. The female cell comes from an organ called the archegonium. When the sex cells become mature the male cell, antherozoid, swims through the moisture on the plant to the female cell, and fertilizes the egg. Then the egg grows into a mature fern plant. This process is called alternation of generations.

DECOMPOSITION OF WOOD

Overview: Students will study logs in various stages of decay. They will be able to identify the different signs of decomposition in order to understand the natural recycling of organic materials.

Materials and Equipment: Pencils, paper and magnifying glasses

Activities: Take the students to a wooded area to study the different stages of decomposing logs. For best results assign groups to different logs and have each group develop a data sheet that describes their log. The date sheet should include information that answers the statements below.

1. Try to decide the decomposition stage.
2. Look for signs of insects in the bark and wood. You may find such adult insects as beetles, springtails, and mites; also larvae, eggs, feces, bored holes and chewed wood bits. Try to relate the kinds of insects found with the stage of decomposition.
3. Look for signs of fungus infection such as the softened texture of the wood, white moldy streaks, mushrooms and the spore forming fruit bodies of a fungus. Consider the availability of moisture and air in various parts of the log. To see the growing part

of a fungus, the thread-like mycelia, a good magnifying glass or microscope may be needed. It is easier to see the effects of fungus on wood than to find the fungus itself.

4. What would happen if all the trees and leaves were cleared away before they could decompose?

5. What would happen if growing things didn't decompose?

Helpful Hints:

A tree borrows materials it needs from the soil to grow. When it dies, the wood decomposes or breaks down and the borrowed materials return to the soil. These materials are used over and over again.

A community of organisms is attracted to the tree when it falls. They use the tree as a home for shelter, they feed upon the dead organic material and as a result they decompose the tree.

Fungi and bacteria are responsible for most of the decomposition of a tree, however, insects and other small animals play an important role. Wood-rotting fungus can not grow without water and oxygen, but small animals like insects, sowbugs, and worms, break up the wood exposing new areas to air and water so that the fungus can obtain a start.

Fungus spores are spread from place to place by wind, water and animals. Animals carry spores on their bodies as well as in their feces.

The fungus softens the wood and allows many more members of the log community to feed on the wood and house themselves in the wood. Some members of the log community feed on the wood, like the fungus and insects; others feed on the fungus, such as some insects; still others feed on the insects, such as spiders and shrews; resulting in a variety of food chains and webs.

The members of a log community change as the log decomposes. When a tree falls, boring beetles tunnel under the bark, loosening it, and opening passages into the wood for air, moisture and fungus spores. The fungi soften the wood by secreting acids and enzymes which dissolve it into simpler substances. As the wood is softened, the boring beetles are replaced by other insects which favor soft wood, or feed on fungus. One fungus is replaced by another series, each using up the substances it needs, then being followed by another which can use what is left.

Bacteria breaks down by-products of the fungi into still

simpler substances.

There is a series or succession of communities of organisms which are associated with a log that is decomposing. The climax or final stage of the succession is reached when the log has crumbled into soil.

A decomposing log can be divided into four succession stages, but remember that one stage blends into the next in a continuous succession process. The stages are listed below:

1. Newly fallen with bark still tightly attached.
2. Bark loosened but the wood still quite firm.
3. Bark falling away and the wood soft and spongy.
4. Wood crumbling into soil, often with new plants beginning to grow in it.

PLOT STUDY

Overview: Students will become aware of the many organic and inorganic materials that can be found in a small area.

Materials and Equipment: Paper, pencil, hand lens and pieces of string 4 feet long

Activities: Divide the class into several groups. Have each group make a circle with their string on the ground. If possible assign some of the groups to grassy areas and some to wooded areas. Each group is to make a list of everything that they can find within their circle.

Questions:

1. How many different animals were found?
2. How many different plants were found?
3. What parts of plants were found?
4. How thick was the litter? Would it be the same in a wooded and grassy area? If so, why?
5. How do the animals found depend upon the plants?
6. How do the plants found depend upon the animals?
7. Is there a food chain present in the circle?

Helpful Hints:

1. If you can't name the things seen, draw a picture or describe them.
2. Look up and name everything that is found directly above the circle.

3. Name everything on the surface of the ground.

4. Very carefully sift through the litter looking for animals and different materials that are at different stages of decay.

When the groups have finished this activity, assemble everyone and go over the lists.

SEED DISPERSAL

Overview: Students will learn how the structual adaptations of seeds provide for seed dispersal.

Materials and Equipment: Paper and pencil

Activities: Take the class outside and have them find as many examples of seeds as they can. Then have them describe the seeds on paper as to their structure. Does the seed's structure provide for seed dispersal?

Examples:

Poppy - The mature fruit or capsule has a ring of openings or pores at its top and is developed at the tip of a long stalk. When the capsules are shaken by the wind, the tiny seeds sift out through the pores, a few at a time, and are carried away.

Maple - The paired, winged fruits are well adapted to be carried away from the parent plant by the wind.

Touch-Me-Not - In this species the mature fruit is a fleshy capsule. If a fruit is pinched or even touched when ripe, the capsule wall suddenly splits into a number of segments that roll up with considerable froce, thereby scattering the seeds.

Cocklebur - The paired pistillate flowers are enclosed in a protective coat composed of hooked, spine-like bracts. When the fruit is mature, this outer covering serves to attach the fruits to the fur of mammals that brush up against the plant. When dislodged it may be miles from the parent plant.

Dandelion - Each single-seeded fruit is equipped with a parachute that is actually made up of delicate filaments derived from the colyx of the flower. When the fruit is mature the wind detaches the fruit from the disc of the inflorescence and carries them away from the parent plant.

MONOCOTS AND DICOTS

Overview: Students will become acquainted with the difference between monocots and dicots.

Materials and Equipment: Paper, pencils and hand lens.

Activities: Before going outside divide the class into groups of four. Then take the students outside and ask them to locate a monocot and a dicot. Have them draw a sketch of a stem (cross section), leaf, flower and/or seed of each plant.

Helpful Hints:

Monocots - have leaves in which the main veins are almost parallel; in the seed there is one of the "seed leaves" present; most of the stem consists of pith surrounded by a harder outer layer and in a cross-section the vascular strands look like islands scattered through the pith; and the flower parts occur in threes or multiples of three.

Dicots - have leaves in which the veins are branched and netted; the seed contains two cotyledons; the stem has a vascular system that surrounds the pith, either as a cylinder or as a ring of separate strands; and the flowers usually have parts that are present in fours, fives, or multiples of these numbers.

FACTORS INFLUENCING TREE GROWTH

Overview: Students will identify different areas where different kinds of trees grow and the factors that influence their growth.

Materials and Equipment: Paper and pencil

Activities: Take students to a large wooded and hilly area. Starting in a valley, preferably near a stream, have the students look around them and describe the trees they find and the habitats in which they grow.

Helpful Hints:

1. Ground is moist most of the time.
2. Trees are usually deciduous.
3. Soil is richer in the valley because topsoil has washed to the valley from the hillside.
4. The air is usually cooler and damper than on top of a hill.

Take the students from the valley to the top of a hill. Have the students look around them and describe the trees they find and the habitats in which they grow.

Helpful Hints:

1. The ground is drier than in the valley.
2. The trees are usually pines on hills in Alabama.

3. The soil is not as rich as the soil found in the valley. This is due to washing.

4. The air is drier.

Now take the students back down the hill toward the stream and have them look for the transition areas between the top of the hill habitat and the valley habitat of trees.

MOISTURE EFFECTS TREE GROWTH

Overview: Students will compare and discover the effect that moisture has on tree growth.

Materials and Equipment: Paper, pencil and increment borer

Activities: Take the students to an area where two trees of the same kind can be studied. One of the trees should be located on the side or top of a hill where the ground is usually dry. The other tree should be located in an area where the ground stays mosit most of the time.

After visiting both trees, divide the class into two groups. Each group should visit each tree separately and write a description comparing what effect moisture has on the trees in their location.

Helpful Hints:

1. Is there other vegetation in the immediate area that is in competition for the moisture?
2. How deep is the local water table? This information can be obtained from the Soil Conservation Service.
3. From what direction does the sunlight come? North and East slopes usually are more moist than slopes facing south and west.
4. How does the topography effect the amount of moisture for the trees?
5. Which tree is the oldest? Using on increment borer, determine the age of both trees.

6. Does size depict age?

7. What does the amount of moisture have to do with the size of the tree?

PARTS OF PLANTS

Overview: Students will become acquainted with the different parts of plants and their functions.

Materials and Equipment: Paper, pencils and a shovel

Activities: Before going outside divide the class into groups of twos and send them on a plant gathering expedition to various parts of the campus. Each group should collect uprooted specimen of at least two different plants.

Assemble the class and have them sketch their plants, showing the roots, stem, leaves, flowers or fruit.

Discuss with the students the parts of plants and how these parts differ on other plants.

Example Questions:

1. What two types of root systems did you find?
2. Do all plants have bark?
3. Why do some stems bend more easily than others?
4. What type of leaf patterns did you find?
5. What kind of flowers did you find?
6. What kind of seeds did you find?
7. Is the plant a monocot or dicot?

ROOTS OF PLANTS

Overview: Students will learn that roots take in water and minerals that are necessary for plant growth. Roots support or anchor the plants. Roots store food. Some foods are provided by the root part of plants.

Materials and Equipment: Root plants, construction paper, magic markers, scissors

Activities:

The student will be asked to bring a root from a garden that is used as a food on his table.

Take these outside and compare the various sizes and shapes of the different roots.

Various root systems of flowers, vegetables and trees can be examined in their natural setting.

The dandelion root can be compared with the other roots. Some plants can be pulled up on the school campus for the roots to be examined.

Measure from the trunk of a tree to the furtherest limb to see how far roots extend from the tree.

Make a bulletin board from the ideas they have learned from studying roots.

Make an animal from root plants. Use the potato, peanut, carrot and other plants.

Draw a picture of a root on construction paper that humans eat. Cut it out and draw a face on it with a magic marker. Display the pictures on a nutrition bulletin board.

Questions:

1. When you see a growing plant, where are the roots found?
2. How are roots alike?
3. How are roots different?
4. How tall is the tallest root in your collection?
5. What three main things do roots need to grow strong and healthy?
6. List the different colors of the roots collected.
7. How are roots important to the plant?
8. Where is the food stored that is made by the leaves?
9. Name some roots that are used for food.
10. What holds the tree up?
11. What part takes water to the rest of the tree?

LIGHT EFFECTS TREE GROWTH

Overview: Students will compare and discover the effect that light has on the growth of a tree.

Materials and Equipment: Paper, pencil and increment borer

Activities: Take the students to an area where two trees of the same kind can be studied. One of the trees should be located in an open field so that sunlight can reach the tree from all angles. The other tree should be located in a deep forest where it has to compete with other trees for sunlight.

After visiting both trees, divide the class into two groups. Each group should visit each tree separately and write a description comparing what effect sunlight has on the trees in their location.

Helpful Hints:

1. Can the tree obtain sunlight from all angles?
2. How large is the vegetation that is found around the tree?
3. From which direction does the sunlight come?
4. Does tree grown in the open have more limbs and a greater crown? The lack of sunlight causes forest grown trees to loose their lower limbs. They die and fall off the tree. Trees in the open receive enough sunlight for these limbs to continue growing.
5. Which tree is usually taller? The tree in the forest

usually grows taller because it is competing for sunlight. The open tree tends to spread out.

6. Which tree is the oldest? Using an increment borer determine the age of both trees.

7. Does size depict age?

8. What does the amount of sunlight have to do with the size of a tree?

TRANSPIRATION

Overview: Students will observe the transpiration process of leaves.

Materials and Equipment: Several clear plastic garbage bags, string and a graduated cylinder

Activities: Take the students outside and place a plastic garbage bag over a limb of a tree. Then discuss with the students the process of transpiration.

By the end of the period there will be some condensation in the bag. Check the bag the next day and measure the amount of moisture collected.

This experiment should be done several times on different types of trees.

It is also interesting to compare the amount of water transpired on cool and warm days, sunny and cloudy days, wet and dry days, and during the daylight and night hours.

LET'S FEEL A LEAF

Overview: Students will learn to identify leaves by their shape, size, texture by just feeling them.

Materials and Equipment: One blindfold and a tree identification book for every four students

Activities: Divide the class into groups of four and take them outside. Each group is to pick 8 to 10 leaves from different trees and identify them.

Give the students time to examine the shapes, sizes, veination, texture and possibly the smell of each leaf. Then blindfold one member of each group. Have another member hand the blindfolded student one leaf at a time to identify.

A second activity could be done in the some manner that would teach the students to identify trees by the feel of their bark.

TEMPERATURE

Overview: Students will learn how temperature can vary greatly in a small area, due to man-made and natural objects.

Materials and Equipment: Paper, pencil and thermometer

Activities: Before going outside divide the class into groups to measure the temperature in a variety of places. Compare the reading taken at one time in the day with those taken at another time. Then discuss some effects of weather.

Example:

1. Ground surface
2. A few inches down in the ground
3. A foot above the ground
4. Six feet above the ground
5. On the sidewalk
6. On black top
7. In the shade of a tree
8. In the sun and shade - on the south-facing slope, on a north-facing slope or on the north and south sides of a building.

Example Questions:

1. Do the plants that grow in direct sunlight also grow in the shade?

2. Do the plants that grow in the shade also grow in direct sunlight? Under what conditions is the greatest variety found?
3. Where do you find the greatest quantity of plants?
4. How does temperature affect animal activity?
5. Where do different animals go during cold days? Where can they be found on hot days?

WEATHER FORECASTING

Overview: Students will learn how to forecast the weather.

Materials and Equipment: Worksheet, pencil, thermometer, barometer, wind vane, hygrometer and precipitation gauge.

Activities: Take the class outside each day and have them do the following worksheet and predict the weather.

Weather Worksheet

Date _____ Time _____ Student's Name _____

Temperature:

Present Reading ____

Last Reading ____

Clouds:

Kind _____

Percent of Coverage _____

Wind:

Direction _____

Speed _____

Precipitation:

Inches _____

Type _____

Humidity:

Percent _____

Barometer Readings:

Present _____

Last _____

Falling or Rising _____

Steady _____

Helpful Hints:

1. A "low" is approaching when the barometer falls. It is accompanied by a storm.

2. A "high" with fair weather is approaching when the barometer begins to rise.

3. In winter the passing of a "low" is followed by colder weather.

4. In summer the passing of a "low" is followed by warmer weather.

5. A "low" with a storm is indicated when the sky is gray and winds from the west are blowing cirro-stratus, and cirrus clouds.

6. When wind from the southeast changes to the southwest a "low" has passed.

7. A "low" is coming from the west when winds change from south to southeast. Rain will probably follow within 24 hours.

8. Winds changing from the east or northeast to the northwest indicate that the "low" has moved.

9. Thunderstorms usually occur in the spring on calm, humid and warm to hot days.

10. A bright blue sky with cirrus and wind from the west or northwest usually indicates fair weather for the next 24 to 48 hours.

11. Rain or snow flurries may happen if there is a bright blue sky with numerous cumulus clouds that are followed by strato-cumulus clouds. By sunset the sky will probably be clear.

12. Frost will form in low places in the spring and fall if the night is clear, calm and the temperature drops to approximately 40° at night.

13. If there is no wind and the sky is clear dew will form at night.

Beaufort Wind Scale (M.P.H.)

Less than 1 - smoke rises vertically

1 - 3 direction shown by smoke

4 - 8 leaves rustle, vane moved by wind

9 - 12 leaves and twigs in constant motion

13 - 18 raises dust and paper

19 - 24 small trees sway

25 - 31 large branches move

39 - 46 twigs break off trees

47 - 54 light storm damage

55 - 63 trees uprooted

64 - 75 rarely encountered, widespread damage

75 + evaucate to safe surroundings

WHERE DO ANIMALS LIVE?

Overview: Animals like plants are adapted for life in their environment. To help your students understand where animals live, take them to a nearby forest. Have the students search for animal homes and complete the work sheet.

Materials and Equipment: Pencil and student worksheet

Example Questions:

1. Do forest animals have a home?
2. Name some animals and tell where they live.
3. Where in the forest would you look for animal homes?
4. What are some animals that live in colonies?

Kind of Animal	Where is the animal's home located?	What is the shape of the home?	What are the materials used to make the home?	Does the home provide protection?	Does the animal store food in the home?	Do the animals live in colonies?

STUDENT WORKSHEET

AMPHIBIAN HABITAT

Overview: The students will be examining different areas for organic and inorganic material that is necessary for the survival of an amphibian.

Materials and Equipment: Paper, pencil, and five index cards each with the different name of an amphibian written on it. Example: salamander, mud puppy, bull frog, tree frog and toad.

Activities: Place the index cards in different habitats around the campus. Divide the class into five groups, each group visiting a different card. The students are to write five reasons why they think the amphibian in this habitat could or could not survive. Upon completion the whole group is to move to the next card and do the same.

After all groups have visited each card, have a class discussion about the amphibian habitats.

Questions:

1. How often do amphibians need a pool or stream of water?
2. What do the amphibians we have discussed eat?
3. Do amphibians have gills?
4. Do all amphibians have legs?
5. In what type of water are tadpoles found?

A CIRCUIT TRAINING UNIT

Overview: This unit will have a functional approach design in which the students will become more physically fit, they will gain knowledge on how to obtain a more healthy body and they will also become aware of and gain more knowledge about the natural environment.

Materials and Equipment: Each activity will require different equipment.

Activities: Set up a series of stations that are located outside in different areas in order to study the environment around them.

The students will be subjected to a series of physical activities daily at each of the stations which operate simultaneously. In other words, the class will be divided into groups, each group starting at a different station, and rotating to the next station until they have completed all of the stations.

After completing the circuit training each day, assemble the class at one of the stations and discuss the benefits of the physical activity, what muscles in particular were used and an aspect of the natural environment.

Example Stations:

1. Jogging - A minimum of a half-mile jogging course should be marked off that includes a steep hill as well as a flat area.

   Example Questions:

   A. What muscles in your legs did you use?

   B. Why is it harder to go uphill?

   C. Does your heart beat faster when jogging up a hill?

   D. Why do you breathe deeper when jogging?

   E. Is it harder to jog on a warm or hot day? Why?

   F. What is air pollution?

   G. How does air pollution affect our bodies?

   H. How does air pollution affect plants?

   I. What is the government doing to correct air pollution?

   J. What can you as an individual do to help correct air pollution?

   K. Does smoking affect our bodies? How?

2. Jumping Jacks - This station should be located in an area where the students can see an eroded area as they exercise.

   Example Questions:

   A. What muscles did you use in this exercise?

   B. Why is this exercise good for you?

C. Will this exercise help your coordination?

D. Do you notice anything wrong with this area?

E. What is erosion?

F. What causes erosion?

G. How can we prevent erosion?

H. Was this erosion caused by man?

I. Can nature cause erosion?

3. Tug-of-War - The best place to have a tug-of-war is across a small stream. Of course, the losers get wet.

Example Questions:

A. What muscles did you use in this activity?

B. Which is the most important factor in this activity: weight, strength or quickness?

C. Does the creek look polluted?

D. Is clear water always drinkable?

E. If water is murky or cloudy, is it safe to drink?

F. What chemicals are added to our town's drinking water?

G. What are some sources of water pollution?

H. Why has water pollution become a national problem?

I. What can we do to prevent water pollution?

4. Log Walk - This activity is to take place on a long narrow log that is suspended between four trees by ropes. The log should be above the ground only a few inches. As the students try to walk the length of the log it will swing with their body motion.

The students should try to walk the log backward, sideways as well as forward.

Example Questions:

A. Why is it desirable to have a good sense of balance?

B. Are balance and coordination related?

C. Were your arms by your sides when you walked the log?

D. What part do your eyes play in your ability to balance?

E. Do your ears have anything to do with your sense of balance?

F. Why is this log here?

G. What is happening to it?

H. What kinds of animals live in or on the log?

I. What kinds of plants live in or on the log?

5. Chinning - A tree limb will be used as a chinning bar.

Example Questions:

A. What muslces were used during the chinning activity?

B. Why is this exercise good for you?

C. Will the limb be higher next year, due to the growth of the tree?

D. What kind of a tree is this?

E. What do the seeds look like?

F. What kinds of poisonous vines grow on trees?

G. Can you identify poison ivy and poison oak?

H. What can you do to prevent poison ivy or oak?

I. What do you do if you have poison ivy or oak?

J. Why shouldn't you burn poison ivy or oak?